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BRITISH AND FOREIGN.

EDITED BY

BERTHOLD SEEMANN, PH.D., F.L.S.,

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"Nunquam otiosus."

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Isoëtes echinospora, *Dur.*

THE

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ON BRITISH SPECIES OF ISOËTES.*

By Charles C. Babington, M.A., F.R.S., F.L.S.,

Professor of Botany in the University of Cambridge.

(Plate I.)

Until very recently no person had any idea that we possessed in England more than one species of *Isoëtes;* indeed, the time is not far distant when no botanist suspected that more than one species existed in Europe, or even in the whole world. We find Messrs. Hooker and Arnott, in the eighth edition of their 'British Flora' (published in 1860), saying that "there is probably only one species of the genus." Not having materials at hand, I am unable to state how many species are really to be found in Europe; and we shall probably not be accurately informed on that subject until M. Durieu de Maisonneuve publishes the monograph which has been so long expected. I possess the following European species in my herbarium:—(1) *I. lacustris*, L., (2) *I. echinospora*, Dur., (3) *I. tenuissima*, Bor., (4) *I. adspersa*, A.Br., (5) *I. setacea*, Del., (6) *I. velata*, Bory, (7) *I. Hystrix*, Dur., and (8) *I. Duriæi*, Bory. For specimens of some of these I am indebted to M. Durieu, and for others to my esteemed friend M. J. Gay, of Paris. In the 'British Flora' (1862), Sir W. J. Hooker, although obliged to allow that at least two species exist, viz. a plant with its rhizome more or less covered by the per-

* An able contribution towards the natural history of *Isoëtes* has been published by Dr. Alexander Braun, Professor of Botany at Berlin, in the third and fourth numbers of the Transactions of the Botanic Society of the Province of Brandenburg and the adjacent Districts (Berlin, 1862, 8vo), from which we may be tempted to give extracts on a future occasion.—Ed.

sistent hardened leaf-bases, which terminate in three curious spines, which he calls *I. Duriæi*, and the *I. lacustris*, which totally wants those hard parts, nevertheless is manifestly unwilling to allow of the existence of any others. I can only suppose that he has never examined with the microscope the structure of the macrospores of the plants, for, had he done so, it is scarcely possible to believe that he could arrive at such a conclusion.

But it is not proposed to enter here into a discussion of the distinctive characters of the species mentioned above, of which the first six belong to the *I. lacustris* of Hooker, and the seventh and eighth to his *I. Duriæi*, but to give a popular account of the proceedings of myself and others in the discovery of *I. echinospora* in England and Scotland, and *I. Hystrix* in Guernsey. To begin with *I. Hystrix*, Dur., which, having as yet been found only in Guernsey, has no true claim to be included in the British flora. My first information of its discovery was contained in a letter from a very intelligent and obliging gardener in Guernsey, Mr. G. Wolsey, dated 15th October, 1860. It contained a bit of the *Isoëtes*, asking its name, and mentioning that it was found on L'Ancresse Common, in Guernsey, in June of that year. At a subsequent time I obtained several more good specimens of the plant from him, and was enabled, by careful examination, and the comparison of of them with the plate (36) of *I. Hystrix* and *I. Duriæi* contained in the 'Expédition scientifique de l'Algérie,' and the descriptions given by Cosson in 'Notes sur quelques Plantes nouvelles ou critiques' (p. 70), and the 'Comptes-rendus de l'Académie des Sciences,' xviii. 1167, to ascertain with certainty that Wolsey's plant is the *I. Hystrix*. Before such examination, Dr. Joseph Hooker was of opinion that it was *I. Duriæi*; but it must be added that he had no macrospores to examine, for the first specimen sent to me, and shown to him, retained only the microspores. Our specimens are very similar to some kindly sent to me by Gay, as gathered by Durieu "in graminosis arenosis siccis circa Vasconiæ maritimæ lacum *Cazau*," in July, 1860. He marks it as "forma phyllopodiis abbreviatis," in which respect the Guernsey and Cazau specimens differ remarkably from those from Algeria,—remarkably, I should say, in appearance, not in reality; for the structure is the same, but the persistent phyllopodes are fewer in number and shorter. Indeed, even the Algerine specimens now before me are not nearly so spinous as that which was selected for delineation in the

'Expédition scientifique.' Although I could not have the slightest doubt concerning the name of the plant, I took an opportunity of sending specimens to France, and obtaining from M. Durieu de Maisonneuve, the first describer of the species, and M. J. Gay, the next best authority on the genus, a confirmation of my nomenclature. I need not enter into a discussion of the characters of the plant, for they are given, to the best of my ability, in the last edition of my 'Manual;' and a good illustration of it, under the mistaken name of *I. Duriæi*, is to be found in Hooker's 'British Ferns' (t. 56). Nevertheless, it may be well to remark that the macrospores of *I. Hystrix* are bluntly tubercled, whilst those of *I. Duriæi* are "fortement et profondément scrobiculées;" that is to say, the whole macrospore is covered with a network of elevated lines with deep hollows between them in *I. Duriæi*, and with minute blunt tubercles in *I. Hystrix*. It is true that a tolerably high magnifying power is required to show these structures; but of course that does not detract from their value. We may reasonably hope that this curious plant will be found in Devon or Cornwall before many years have passed.

I now turn to the other addition to our flora,—a true addition, since it is found in England and Scotland. On August 6, 1845, in company with Dr. Balfour and a small party of students, I visited Loch Sloy and Ben Voirlich, near Loch Lomond, in Scotland, and gathered what I then called *I. lacustris* in a little pool near to the top of the mountain. In 1847 I collected a plant, also then called *I. lacustris*, in the river that runs out of the lakes at Llanberis, in North Wales: on that occasion in company with my friend Newbould. At an earlier time Mr. W. Wilson gathered a specimen of the same plant as those just mentioned, in "a pool near Llyn-y-Cwn," near Llanberis. The botanical guide, John Roberts, calls this pool Llyn-y-Cwn-bach. The specimens remained wrongly named until 1860, in which year I sent a considerable number of specimens of *Isoëtes* to M. Gay, at Paris. By letter, dated September 5 of that year, he informed me that my specimens proved that there were two species in the country surrounding the village of Llanberis, namely *I. lacustris*, Linn., and *I. echinospora*, Dur. He also kindly gave me the requisite information by which to know them. I thereby determined the true name of the Scottish specimens and that found by Mr. Wilson; but, to render assurance doubly sure, I sent them to M. Gay, who showed the whole collection

to M. Durieu, and they concurred in stating that the plants from the two places near Llanberis and that from Ben Voirlich are *I. echinospora*. In the spring of 1862, I obtained, through the kindness of the Rev. A. Beverly and Mr. W. Sutherland (both of Aberdeen), specimens of the *I. echinospora* gathered in a lake not many miles from that city, and called by the two names of Loch Park and Loch Drum. These I sent to Paris, and had my determination of them also confirmed.

Having thus fully established the existence of the plant in England and Scotland, and convinced myself of the distinctness of the species from *I. lacustris*, I introduced it into the fifth edition of my 'Manual,' which was published in May, 1862.

Soon after that date, I learned from M. Gay that he intended to visit North Wales for the purpose of examining *Isoëtes*, as he had recently done in Central France (of which journey a very full and interesting account will be found in the 'Bulletin de la Société Botanique de France,' viii. and ix.), and determined to join him in his search. I also persuaded my accurate friend Newbould to accompany me. The three arrived at Llanberis on August 13, and remained there until August 21, when we were obliged to leave M. Gay to complete his researches alone. We found *I. lacustris* to be exceedingly abundant in nearly all the lakes and mountain tarns of that district, and obtained *I. echinospora* in the places where Mr. Wilson and I had formerly gathered it, and in several other places in the neighbourhood. *I. echinospora* is by far the less common plant, and is never found except where there is peat at the bottom of the water. After a very little experience, assisted by the teaching of M. Gay, Mr. Newbould and I acquired facility in distinguishing the plants when growing, and could lean over the side of a boat and select the *I. echinospora* with certainty. The spreading leaves (fronds) and pale green colour of it contrast well with the dark tint and usually erect leaves of *I. lacustris*. The plants sometimes grow together, but, as I have already said, it is useless to look for *I. echinospora* in any place where the water does not rest upon a peat soil.

It now remains for British botanists to discover the distribution of these two plants in Britain. There must be more than two localities for it in Scotland; there probably are others in England and Wales, and surely it exists in Ireland. I have taken some trouble to obtain specimens from different places, but have not succeeded in acquiring

much information beyond what is stated above, and none relative to *I. echinospora*. Botanical collectors do not seem to have taken, nor do now take, much interest in the genus. Let us hope that these hastily-written remarks may stir them up to greater activity. M. Gay is doing his utmost to learn the distribution of the plant in France, Dr. A. Braun is doing the same in Germany, and surely English botanists should not be laggards in the chase. Allow me to constitute myself a centre of communication on matters relating to *Isoëtes*, and to request all persons interested in the plants to write to me at Cambridge.

In conclusion, it may be well to add, that *I. echinospora* was first published and characterized with that name by Durieu de Maisonneuve in the 'Bulletin de la Société Botanique de France' (viii. 164, March 22, 1861), and that the first ecord of its discovery in Britain is, I believe, contained in a letter addressed by me to the Linnean Society of London, and read at the meeting of March 20, 1862, and published in the Proceedings of the Society for that year, at p. lxiii.

EXPLANATION OF PLATE I.

Isoëtes echinospora, Dur.—Fig. 1. Interior view of an inner leaf. 2. Capsule. 3. Section of capsule. 4. Microspores. 5. Exterior view of an outer leaf. 6. Interior view of the base of an outer leaf. 7. Capsule. 8. Section of capsule. 9. Macrospores.

ANTHURIUM GLADIIFOLIUM, A NEW BRAZILIAN AROIDEA.

BY DR. H. SCHOTT,

Director of the Imperial Gardens at Schœnbrunn.

ANTHURIUM *gladiifolium*, Schott.—*Petiolus* pedalis et ultra, crassitie pennæ anserinæ majoris, antice deplanatus et marginibus acietatis auctus. *Geniculum* leviter incrassatum, 6-8 lineas longum. *Lamina* folii subcoriacea, supra glauco-viridis, infra ex glauco flavens, gladiiformis, 2½ pedes longa, 4 pollices et ultra lata, basi rotundata vel cuneata, apice sensim angustata et exitu cuspidato-apiculata. *Costa* utrinque convexa. *Venæ* costales subimmersæ, aperte patentes et patentes. *Pseudoneurum* intimum a margine remotiusculum. *Pedunculus* 22–24 pollices longus, pennæ anserinæ tenuioris crassitiæ, apicem versus livescens. *Spatha* lanceolata, basi antice subdecurrens, quasi oblique amplexa et horizontaliter reversa, apice acuta, 2–2½ pollices

longa, 6–7 lineas lata. *Spadix* myosuroideus, 4–5 pollices longus, 4–5 lineas crassus, sursum versus leviter attenuatus, apice obtusatus, colore ex brunneo-violascente.

HAB.—Brasilia, *Archidux Ferd. Maximil.*

ON CERTAIN FORMS OF THE COMMON RYE-GRASS (*Lolium perenne*, Linn.).

By MAXWELL T. MASTERS, M.D., F.L.S.,
Lecturer on Botany, St. George's Hospital.

One great advantage likely to accrue from the publication of Mr. Darwin's well-known books on the 'Origin of Species' and on the 'Fertilization of Orchids' is the reconciliation, so to speak, of the two opposite Botanical parties—the "lumpers" and the "hair-splitters." Both these classes of investigators are without doubt equally eager in their search after truth, although they follow the chase in two very different fashions. Mr. Darwin's views and observations on the variations occurring in plants and animals, from divers causes, will no doubt attract much attention to the subject on the part of those who habitually study the most minute details of structure, and who are thought by their opponents to pay undue importance to them; while the latter class of observers must now admit that these apparently trifling variations may be of extreme consequence in the economy of the plant or animal, and may even be of great service for classificatory purposes. In this latter point of view they will, contrary to what they have previously supposed, be carrying out that rule of systematic botany which enjoins that characters drawn from combined morphological and physiological data, shall have higher value than those founded upon one branch of science only.*

In the present communication I am only desirous of directing attention to certain variations in a well-known and widely-diffused plant, and I have no wish to draw any crude conclusions from them, nor to enter into disputed points connected with the specific identity of *Lolium perenne* with other closely allied forms. The plant in question, and its ordinary mode of inflorescence, are too well known to need description

* This subject is more fully entered into in a paper, by the writer of this notice, in the Brit. and For. Med. Chir. Review, January, 1862.

in this place. The variations from it which form the subject of the present notice, may for convenience sake be arranged under the following heads.

Deviations affecting—

A. The rachis or axis of the inflorescence.
B. The arrangement of the spikelets.
C. The axis of the spikelets.
D. The disposition of the flowers.
E. The structure of the flowers.

A. Affecting the main rachis of the inflorescence.

1. Increased length of the internodes of the main rachis, so that the spikelets become separated one from the other by much longer intervals than usual. This form is usually accompanied by atrophy of the spikelets, which are smaller than usual, and some of the constituent florets are imperfectly developed. The whole plant is feeble in habit and undersized, and is usually met with in situations and under circumstances that seem sufficient to account for its starved appearance. This is probably what has been called *L. tenue*, L.

2. The converse of the preceding is shown in the variety *cristatum*, where the spikelets throughout the whole length of the inflorescence are as closely packed as they are at the uppermost portion of the rachis of the ordinary form. Here, then, each spikelet is in contact with the one above and below it, on the same side of the rachis, throughout its entire length. What has been termed the Battledore Ray-grass is merely a modification or less perfect form of this variety, and is characterized by the presence of an egg-shaped spike of not more than one-fourth the usual length.

3. Branching of the rachis, so as to form a compound spike, as in the var. sometimes called *compositum*, or at other times *paniculatum*. The degree of branching varies very much in different specimens, and is carried to such an extent in one specimen in the Hookerian herbarium, as to constitute a noble-looking plant. A similar variation is common enough in other Grasses, such as *Triticum*, Maize, etc., and is the normal state in several species. In the species in question, the branching of the inflorescence seems to result from good living, as the more perfect specimens of it occur in rich soils and cultivated fields, rather than by the wayside.

B. Deviations affecting the arrangement of the spikelets.

In vars. 1 and 2, the arrangement of the spikelets is necessarily interfered with, but in a manner which is consequent upon the lengthening or shortening of the stem. There are other variations in the disposition of the spikelets not necessarily connected with any alteration in the stem, thus :—

4. Spikelets arranged in pairs on each notch of the rachis, as in *Hordeum* or *Elymus*, not singly as usual, var. *geminatum*, while M. Fournier* (of whose observations I have availed myself in writing this notice) has described a

5. Variety in which the spikelets are arranged spirally round the stem —var. *speirostachyum*. I have not met with perfect instances of this.

C. Deviations affecting the axis of the spikelets.

6. Lengthening of the axis of the spikelet, by which means the florets are more widely separated one from the other than they are under ordinary circumstances. This may occur to a varying degree, and may be unaccompanied by any other change, although it is not unfrequently met with in conjunction with var. 3. When well marked, it alters the general aspect of the plant very much. A specimen in my possession, where every spikelet is thus affected, and where the axis is not only lengthened but flexuose, has a very elegant appearance. The converse of this, where the interfloral spaces are shorter than usual, is necessarily so slight in amount, as practically to be of little importance.

7. Branching of the axis of the spikelet. Instances of this kind occur in one or more of the spikelets, and as the flowers are arranged on each branch in the same way as on the ordinarily undivided axis, the appearance presented is much the same as in var. 4, where there are two spikelets to each notch of the rachis.

D. Deviations affecting the arrangement of the florets.

8. The florets are usually arranged on either side of the axis of the spikelets, after the same fashion as the spikelets themselves are placed on the sides of the main rachis ; but sometimes it happens that, owing to the arrested growth in length of the axis, the florets are tufted, *i.e.* they are arranged in circles or whorls. In this very curious variety, the shape of the spikelet is much changed ; in place of being flattened and somewhat pointed at its free end, it becomes in this variety almost spherical, hence this variety might be called var. *sphærostachyum*. It

* Bull. Soc. Bot. Fr., 1858. p. 85.

may exist independently of any other change, but more frequently it is combined with partial or complete obliteration of the stamens and pistils, and the substitution for those organs of an equivalent or an increased number of scales. For three years in succession I have noticed plants affected with this variation or deformity in the same locality, intermingled with specimens of the usual appearance.

E. Deviations affecting the structure of the florets.

Under this head are included such changes as the substitution of scales for stamens, etc., as just mentioned; the curious change that brings about the production of leafy buds in the place of flowers, as in the instances of chloranthy or viviparity. These do not come within the scope of the present communication.

Hence, then,—by the lengthening or shortening of the axis, the development of branches from it, the various methods in which the spikelets, or even the flowers, may be arranged in the same species,—a range of variation of considerable extent is brought about, a range much greater in extent than that existing between many so-called species.

ON TECOPHILEACEÆ, A NEW NATURAL ORDER OF MONOCOTYLEDONOUS PLANTS.

By Dr. F. Leybold, of Santiago de Chile.

Herbæ rhizomate bulboso-fibroso, glabræ. *Caulis* scapiformis, simplex vel apice subramosus, nunc aphyllus, nunc foliatus. *Folia* sæpissime omnia radicalia, simplicia, integra, alternantia, linearia, basi vaginantia, caulina sessilia. *Flores* hermaphroditi, subirregulares, nunc solitarii terminales, nunc laxe paniculati, bracteis foliaceis vel ebracteatis. *Perigonium* corollinum semisuperum, breviter tubulosum, hexaphyllopartitum, laciniis biseriatis, interioribus nonnihil minoribus, exterioribus submucronulatis, marcescens. *Stamina* introrsa sex, perigonii fauce inserta, inclusa, tria fertilia collateralia, quorum unum laciniæ exteriori, duo interioribus opposita, *filamentis* subulatis, *antheris* bilocularibus, dorso insertis, versatilibus, apice introrse dehiscentibus, foraminulo in utroque loculorum minuto, basi antice calcaratis, totidem ananthera, longiora, lanceolata, apice subulosa, laciniis duabus exterioribus et interiori opposita. *Ovarium* semi-inferum, triloculare,

multiovulatum. *Ovula* biseriata, adscendentia, columnæ centrali inserta. *Stylus* simplex, cum ovario continuus, basi conicus, filiformis, stigmate capitato trifido. *Capsula* trigona, trilocularis, loculicido-trivalvis. *Semina* plurima, oblonga.—Herbæ *chilenses, monticolæ, vernales.*

Ordo ab *Irideis*, quæ perigonii et rhizomate structura similes, antherarum numero, directione introrsa et dehiscentia earundem foraminiformi loculorum apice, valde diversus.

Tecophilea, *Bertero et Colla.*

Phyganthus, *Pœppig.*

1. Tecophilea *violæflora*, Bert. *Phyganthus vernus*, Pœppig.—T. tenerrima, bulbo fibroso; folio radicali unico, lineari, carinato, apice acuminato-cuspidato, ad marginem subundulato e basi vaginante; scapo erecto, uni- vel rarius bifloro, infra apicem obsolete bibracteolato; flore violaceo.

Hab. In montibus aridis Chile borealis versus prædium "Concon" primo vere (mense Augusto) florens, *Pœppig.* Prope "Quillota" legit orn. Gay, et mense Sept. in monte "Cuesta de Prado" dictu provinciæ Santiago invenit præclar. Philippi.

2. Tecophilea *cyano-crocus*, n. sp., Leybold.—T. bulbo fibroso; foliis radicalibus alternantibus plerumque duobus vel tribus, linearibus, carinatis, undulatis, glaberrimis, reclinatis, e basi vaginante, vagina inclusis membranacea, albida; scapo erecto uni- vel bi- vel trifloro, foliaceo-bracteolato; flore campanulato magno, petalis biseriatis, interioribus angustioribus, exterioribus submucronulatis; staminibus omnibus luteis, calcaribus fertilium subulisque sterilium duplo longiorum pellucide albis; ovario semi-infero, oblongo, obovato, subtrigono; stylo filiformi, apice trifido, fimbriato; ovulis adscendentibus, biseriatis, quinquejugis, longe ellipticis.

Flos conspicuus, colore azureo vel cyaneo, sed *Croci* forma et habitu; petalis tribus inferioribus staminibus sterilibus oppositis, unguem versus atro-cæruleis, tribus superioribus antheris fertilibus oppositis, pallidioribus, albo-pictis, duobus superioribus interioribus basi utrinque albo-fimbriatis.—*Foliorum* consistentia *Ornithogalo* similis.

Hab. Floret mensibus Octobre et Novembre in alta Cordillera provinciæ Santiago dictu "Pínquenes en la Dehesa."

ON SOME OF THE BRITISH PANSIES, AGRESTAL AND MONTANE.

By J. G. Baker, Esq.

According to the masters of the modern French school of descriptive phytography, a number of plants, united under the name of *Viola tricolor*, retain under cultivation characteristics sufficiently distinctive to justify their separation. Is it so, or is it not so? We have really no other practical test to rely upon to decide what are species and what are not, but permanence of diagnostic characteristics; and when that is the case, how can we fairly blame any one for separating plants as distinct if they appear to possess permanent characteristics, or for retaining them as distinct so long as the characteristics assigned to them are not demonstrated, by observation and experiment, to be unstable? At any rate, we may rest assured that in cases of this kind, arguments for synthesis must be supported by a careful record of observed facts of detail to be availing.

To what extent, may I be allowed to ask, is *Viola tricolor* to be seen in Britain at the present time, beyond the bounds of cultivated land? In classifying lately the plants of North Yorkshire, according to their categories of citizenship, the question occurred to me, whether it should be placed as a colonist or a native. I have seen it in two places in woods, but in neither case were they clearly aboriginal woods. I should like to know what are the experiences, in this matter, of other observers.

I gathered, in 1860, near the Spital of Glen Shee, in Perthshire, a Pansy with the habit of growth of *V. tricolor*, but yet apparently with a perennial root, and growing in a station suitable for *V. lutea*, in a meadow near the banks of a stream. The stem is nearly a foot in height, branching at the crown of the root, and as succulent and robust as in ordinary *tricolor*. The leaves do not differ notably from those of the plant first described, the lower ones being broadly ovate, and the upper ones lanceolate. The lateral lobes of the stipules are linear, erecto-patent, or slightly curved; the terminal lobe much larger than the others, elongated, spathulate, entire, or somewhat leaf-like, and very slightly toothed. The lower peduncles are slender, and about three times as long as the leaves; and the sepals are narrowed gradually, and are conspicuously shorter than the petals. The upper petals are broadly obovate in shape, a rich deep purple in colour, mea-

suring three-eighths of an inch in width, and more than half an inch in depth from the apex to the throat; the middle pair are somewhat narrower and paler, and are marked with dark lines at the base; the lowest one considerably broader than the distance from the throat to its outer edge, bright yellow within, dark-coloured lines radiating to its outer half; and the spur is blunt, and violet-coloured, and longer than the calycine appendages. This was submitted to Boreau, and marked by him, "Videtur *V. lepida*, Jordan." This is a plant described in Jordan's 'Pugillus,' page 28, and given there, with a mark of doubt, as a plant of Belgium. Has any wild station since been ascertained for it? My plant agrees very well with the description, unless it be in the spur, which is stated to be "eximie patenti-deflexo." I wish any one who may have the opportunity would search out this plant and investigate it further. I brought home seeds and sowed them, but they did not come up the next spring, probably because they were not ripe enough. The plant grows upon the north side of the stream, just above the bridge nearest the Spital of Glen Shee, and consequently within a short distance of the inn, which is a resting-place for the coaches between Blairgowrie and the Castletown of Braemar. This plant evidently occupies, like *V. sabulosa* and *V. Curtisii*, an intermediate position between *lutea* and *tricolor;* and, as I have indicated already, it is a montane, not an agrestal plant. Jordan compares it to *V. vivariensis*, which is also a montane plant, between *V. tricolor* and *V. lutea.*

We have in North Yorkshire a montane Pansy, which, at first sight, seems to differ notably from *V. lutea*, but which I believe to be connected with it by intermediate stages of gradation. It has small yellow flowers, petals standing forward as in the cornfield *V. arvensis*, stipules with sickle-shaped lateral and crenate leaf-like terminal lobes. This grows upon the Richmond race-course, and, with *Thlaspi occitanum*, at the lead-mines of Copperthwaite Moor, near Reeth. I got seeds at the latter station in autumn, and hope to cultivate it.

The common large-petalled cornfield Pansy of North Yorkshire is a plant of annual duration, which is usually more or less branched at the crown of the root, and has slender, somewhat erecto-patent stems, of about a foot in height. The lower leaves are almost as broad as long, and broadly ovate or even cordate in shape; the higher ones passing, as we ascend the stem, from typically ovate to typically lanceolate; and

all of them having shallow bluntish crenations. The lateral lobes of the stipules are linear-lanceolate, entire, straight or slightly sickle-shaped, the terminal lobe lanceolate, elongated, and somewhat leaf-like, usually with but faint crenations. The peduncles are slender, and conspicuously exceed the leaves, the lower ones being sometimes three or four inches in length. The sepals are lanceolate acuminate. The petals conspicuously exceed the sepals, the upper pair being in shape obovate, in colour a rich deep bluish-purplish, conspicuously overlapping in the fully expanded flower, the middle pair paler and narrower, the lowest petal broadly obovate, about half an inch wide at the broadest portion, and half an inch deep from the margin to the throat; in colour yellowish or whitish, more or less tinged with purple, the throat bright yellow, with seven dark-purplish lines radiating from it. The spur is compressed, purplish and blunt, and exceeds more or less notably the calycine appendages. This is the ordinary form of the plant in the cornfields of North Yorkshire, a plant which was labelled for me by Professor Boreau "Accedit ad *V. Lloydii*, Jordan." Upon comparing with the authenticated *V. Lloydii*, as described in the third edition of the 'Flore du Centre,' vol. ii. p. 81, the only points in which our plant does not quite coincide are in the corolla, which is stated to be "moyenne, dépassant peu le calice," and the spur, which is stated to be shorter than the calycine appendages. In our plant, the spur exceeds the appendages, and the "dépassant," I should say, might be safely used without the "peu" in comparing the petals with the sepals. In the common fallow-field form of the plant, which often flowers quite early in spring, the stems are stronger, and usually diffuse or subprocumbent, the upper leaves broader, the terminal lobe of the stipules more leaf-like and more conspicuously toothed, and the petals deeper in colour than in the summer or autumn-flowering erect state.

I have cultivated two of the forms intermediate between this plant and *V. arvensis*, which this neighbourhood furnishes, in both cases with the result of satisfying myself that they could not safely be separated as species from the plant just described.

The first was a plant of slender habit of growth, with the stem branched from the base. The lower leaves were rounded, but not fully heart-shaped below, sparingly and bluntly crenate, the upper leaves lanceolate, and narrowed gradually into the petiole. The lobes of the lyrate-pinnatifid stipules were all entire, the lateral ones acuminate, the

terminal larger and subspathulate. The peduncles were about twice as long as the leaves, and the sepals slightly shorter than the petals. The petals were much smaller than in the plant already described, all yellow, and only the upper pair with a faint purplish tinge, the upper pair obovate and just overlapping at the base in the fully expanded flower, the middle pair narrower, deeper-coloured at the base, and standing forward from the upper pair in the fully expanded flower, the lowest petal broadly obovate and emarginate, deep yellow at the throat, and marked with seven dark lines, sharply narrowed from the broadest part to the base after a wedge-shaped manner, the spur slender, purplish, incurved, and rather longer than the calycine appendages. This plant, in the shape of its petals and the size of its flowers, occupies an intermediate position between our ordinary cornfield *arvensis* and the plant already described. In the standing forward of the middle pair of petals, it resembled the former, and its petals being larger than in *arvensis*, this character was shown even more conspicuously. But the shape of the lowest petal was peculiar, and in the entire terminal lobe of the stipule it receded from *arvensis* conspicuously. But after one year's cultivation from seed in rich garden soil, it became much more robust in habit, with all the leaves broader, and the lower ones cordate at the base, the terminal lobe of the stipules became more leaf-like, and sometimes slightly toothed, the sepals and petals both more luxuriant, and though in some of the plants the petals were still all yellowish, in others the upper pair took a distinctly marked purplish hue, whilst the middle pair lost their peculiar habit, and the lowest petal its peculiar cuneate-obovate aspect.

The second was a much branched plant, of exceedingly diffuse habit, like the other, gathered in a cornfield in autumn. The stems and leaves were both more hairy than in the plant first described, the lowest leaves ovate, and upper lanceolate and narrowed gradually below. The stipules were narrow, with all the lobes entire, the lower erecto-patent; the terminal lobe elongated, and much larger than any of the others. The peduncles were erecto-patent, often not much longer than the long linear-lanceolate upper leaves, and the sepals slightly shorter than the petals. The petals were somewhat larger than in the plant last described; yellowish, or the upper pair slightly tinged with purple; the upper pair broadly obovate, and overlapping for three-quarters of their length, the lateral pair almost as large and as broad as the upper pair,

the lowest petal deep yellow at the base, with 5–7 purplish streaks, obovate and emarginate, not more sharply narrowed below than in the plant first described; the spur straight, purplish, and exceeding the calycine appendages. This plant was peculiar in its habit of growth, and differed notably from the plant first described in the shape of its leaves and the size and colour of its petals. It was referred doubtfully by Professor Boreau to *V. peregrina*, Jordan, and seems to me to agree exceedingly well with the description from authenticated specimens in the 'Flore du Centre'; but after one year's cultivation from seed in rich garden soil, the leaves became broader and shorter, and the lower ones rounded below, as in the plant first described; the stem became less hairy and less diffuse, the petals larger and more or less tinged with purple, and the upper pair decidedly purplish throughout.

An authenticated specimen, from Mr. E. Edwards, of *V. Rothomagensis* of T. F. Forster, in the 'Flora Tunbridgensis,' does not differ notably from the plant first described. The terminal lobe of the stipules is elongated, more or less crenated, and conspicuously larger than the others, and the petals all more or less purplish and conspicuously longer than the sepals. The true plant of Rouen, it is perhaps hardly needful to say, is a very different plant, with a perennial root, much larger flowers, and stems and stipules as in *V. lutea.*

The ordinary *V. arvensis* of the cornfields of this neighbourhood has strong, erect or suberect stems, usually branched from the crown of the root. The stems and leaves are more or less thickly covered with greyish pubescence; the lower leaves elliptic or ovate-obtuse, or somewhat cordate below, bluntly toothed, and with the haft usually narrowed into the petiole; the upper leaves narrowly lanceolate, the stipules lyrate-pinnatifid, with entire, linear, erecto-patent, lateral lobes, and the terminal lobe large and leaf-like and conspicuously toothed; lower peduncles fully twice as long as the leaves; sepals narrowed more suddenly towards the apex than in the plant first described; petals about as long as, or somewhat shorter than the sepals, all yellow, or the upper ones slightly tinged with lilac, upper pair obovate-oblong, erecto-patent, slightly overlapping, middle pair somewhat narrower and paler and standing forward, the lowest petal cuneate-obovate, emarginate, deep yellow at the throat and marked with five dark lines; spur tinged with purple, thick, blunt, as long as or slightly shorter than the calycine appendages. This was referred by Professor Boreau to *V. contempta*,

Jordan. I have not seen any specimens otherwise authenticated, but upon comparing our plant with the descriptions in the 'Flore du Centre,' it seems to me to differ appreciably from *contempta*, as there described, in stipules, petals, and spur, and upon the whole to correspond better with Jordan's *V. agrestis*. I have not myself grown this plant from seed, but I have seen it under cultivation in the garden of my neighbour Mr. T. J. Foggitt, and have been furnished by him with garden-grown examples. As grown by him in rich garden soil, the leaves became much more luxuriant, and the terminal lobe of the stipules became more leaf-like than in the wild plant, whilst the *arvensis* character of flower was retained, the sepals being now conspicuously longer than the petals, and the spur still about equalling the calycine appendages.

It is much to be wished that some of our British botanists who have gardens would take a little trouble to grow cornfield Pansies from seed, and give us the benefit of their experiences. It is principally with a wish to suggest the doing of this that I have written out these notes.

ON TRYBLIONELLA VICTORIÆ AND DENTICULA SUBTILIS, TWO SPECIES OF BRITISH DIATOMACEÆ.

By W. Carruthers, Esq., F.L.S.

My attention was called to Dr. Grunnow's paper on the family *Nitzschieæ* by a notice of it in the 'Bonplandia' for 1862, page 270, where it is stated that he described a new species, *Tryblionella Victoriæ*, which he had collected on the leaves of *Victoria regia* in Kew Gardens. He was of opinion that it was not indigenous, but probably brought with the plant on which he found it from South America.

By the help of Dr. Seemann, I obtained from Dr. Grunnow a copy of his plate containing the figure of this *Tryblionella*, along with manuscript notes of the characters distinguishing it from the allied species. I have since (January 2nd, 1863) collected specimens in the Victoria tank at Kew, which I found on the leaves of *Pistia Stratiotes*, the great Lily having entirely disappeared during the winter season; indeed the principal tank was empty of water and everything. Dr. Walker-Arnott had already informed me, on the authority of Sir W. J.

Hooker, that the species of *Diatomaceæ* found on the *Victoria* could not have been brought from South America with that plant, for nothing but the seed had been imported originally or since,—no roots, no plants, no earth, no water. Besides, I find it associated with well-known British forms, so that it must be held as truly indigenous to this country.

I have not seen Dr. Grunnow's diagnosis of the species; but as my specimens agree perfectly with his figure, I offer the following, to assist British botanists to determine this interesting and beautiful species :—

TRYBLIONELLA *Victoriæ*, Grunnow, Verhandlungen der k.k. zool.-botanischen Gesellschaft, vol. xii. 1862, tab. xii. fig. 34 :—*Valve* linear, with obtuse ends, and generally with a very slight constriction in the middle, striated. *Striæ* stretching across the valve, those in the centre of the valve perfectly transverse, becoming very slightly convex towards the ends, without a medial line; 18 in ·001; canaliculi obsolete. Length ·0014, breadth ·0007.

This species is nearest to the marine *T. punctata*, but it can be readily distinguished by its shape and the structure of the striæ. *T. punctata*, in all its states, is without constriction in the middle, and always decreases from the broadest part of the valve towards the somewhat acute apex, as represented in Smith's second figure, plate xxx. fig. 261; Grunnow's species, besides having the constricted valve, is rectangular, terminating in an obtuse apex. The striæ of the first species are composed of a series of large dots, easily separated by a comparatively low power, while in the other species a very high power is required to resolve the small dots of the striæ. The shape of *T. marginata*, and the faintness of the striæ in the centre of the valve, prevent it from being confounded with the Kew species.

Denticula subtilis, Grunnow, found in brackish water at Newhaven, and described and figured in the same paper, is Smith's *D. ocellata*, which he obtained, while the sheets of his second volume were passing through the press, from a gathering of Professor Balfour's collected near St. Abb's Head. It was not figured by him, but he gives a clear description, and adds that in the front view it closely resembles *Epithemia Argus*, so that there can be little difficulty in recognizing his species. Dr. Grunnow's figure (l. c. tab. xii. f. 36) is the first published drawing of the species.

REVISION OF THE NATURAL ORDER BIGNONIACEÆ.

By Berthold Seemann, Ph.D., F.L.S., F.R.G.S.

The principal object of my revision of the *Bignoniaceæ*, previous to recasting and rearranging the whole Order, has been to bring the synonyms together, and make out the limits of the *already established* genera and species. With this view, I shall publish the results of my investigations as the complete materials come to hand.

Tecomaria, *Fenzl, Seem.*

Jussieu founded the genus *Tecoma* upon species (*T. pentaphylla*, *radicans*, and *stans*) offering three distinct types of generic structure; and he derived the name from the Aztec word *Tecomaxochitl*, which I found out to mean a flower (*xochitl*) resembling a certain earthenware vessel (*tecomatl*), and which Jussieu believed to be applied by the Mexicans to several species of *Bignoniaceæ*. But neither *T. pentaphylla* nor *T. radicans* grow in the Mexican territory, hence the vernacular name could not apply to them; nor is it borne by *T. stans*, the only Mexican species with which Jussieu was acquainted. Hernandez has furnished a rude figure and description of the *Tecomaxochitl*, a plant with simple leaves, identical with *Solandra guttata*, Don. (*Conf.* Seem. Nomenclature of the American Flora, p. 45.) Thus, finding that no *Bignoniacea* has any genuine claim to the name *Tecoma*, and that if retained at all, *T. pentaphylla* has no more right to bear it than either *T. radicans* or *T. stans*, we violate no principle when we consult our convenience and give it to that type which represents the greatest number of species (viz. *T. pentaphylla*), especially as, in doing so, we escape the necessity of coining new names for the other genera which it will be necessary to restore or establish, viz.—

* *Monostictides.*

1. *Tecomaria*, Fenzl (type: *Tecomaria Capensis*, Fenzl, = *Bignonia Capensis*, Thunb. = *Tecoma Capensis*, Lindl.). Erect shrubs with imparipinnate leaves, inhabiting America, and naturalized in the Old World.

2. *Stenolobium*, D. Don, non Bth. (type: *Stenolobium castaneæfolium*, D. Don, = *Tecoma stans*, Juss.). Erect shrubs with imparipinnate leaves, inhabiting America.

3. *Tecomella*, Seem. (type: *Tecomella undulata*, Seem. = *Tecoma*

undulata, Don, = *T. ? glauca*, De. Cand.). Erect shrubs with simple leaves, inhabiting Asia.

4. *Tecoma*, Juss. (type: *Tecoma pentaphylla*, Juss.). Erect trees with digitate leaves, inhabiting America.

** *Pleiostictides.*

5. *Campsis*, Lour. (type: *Campsis adrepens*, Lour. = *Tecoma grandiflora*, Delaun.). Climbing shrubs with rooting branches and imparipinnate leaves, inhabiting South-Eastern Asia and North America.

6. *Campsidium*, Seem. et Reis. (type: *Campsidium Chilense*, Seem. et Reis.). Winding shrubs with imparipinnate leaves, inhabiting Chile.

7. *Pandorea*, Endl. (type: *Tecoma australis*, R. Brown). Winding shrubs with imparipinnate leaves, inhabiting Australasia.

TECOMARIA, Fenzl, Seem.—*Char. Gen. Calyx* regularis, 5-costatus, 5-dentatus. *Corolla* clavato-tubulosa, leviter curvata, 5-loba, lobis obtusis. *Genitalia* exserta. *Stamina* 4, didynama, omnia fertilia, cum rudimento quinti. *Antheræ* discretæ, glabræ, biloculares. *Capsula* linearis, compressa, siliquæformis, bivalvis, septo valvis contrario. *Stigma* bilamellatum. *Semina* alata, 1-seriata.—Frutices *stantes* Americæ tropicæ, foliis *imparipinnatis*, foliolis *serratis;* floribus *terminalibus, racemosis vel paniculatis, aurantiaco-coccineis, incarnatis v. fulvis.*

Fenzl, in his able papers on *Bignoniaceæ*, was the first to point out the generic distinction of *Tecoma Capensis* from the host of species with which it had until then been associated, and established the genus *Tecomaria*, which differs from its allies in having a regular 5-ribbed and 5-toothed calyx, a tubular corolla, exserted genitals, and only one row of seeds on each side of the septum.

1. TECOMARIA *fulva;* fruticosa, ramulis angulatis foliisque hirtellis vel subglabris; foliis alternis vel oppositis, 5–9-jugis cum impari, petiolo communi inter juga alato, foliolis subsessilibus cuneato-obovatis vel oblongis obtusis truncatis vel acutis, serratis; paniculis terminalibus multifloris; calyce campanulato, 5-nervio, nervis subcostatis in dentes 5 acutos margine ciliatos desinentibus; corolla clavato-tubulosa leviter curvata (supra rubra, subtus flava), lobis rotundatis ciliatis, extus glabra, intus versus basin villosula; staminibus supra medium tubi inserta, filamentis antheris ovario styloque glabris; capsula (4–5 poll. long., 2–3 lin. lat.) glabra (v. s. sp.).

Tecomaria fulva, *Seem. mss.*

Tecoma fulva, *G. Don, Gen. Syst.* iv. p. 224; *De Cand. Prod.* ix. p. 224; *Hook. Bot. Mag. t.* 4896. *Van Houtte, Flor. des Ser. t.* 1116.

Tecoma? Guarume?, *De Cand. Prod.* ix. p. 224.

Tecoma alata, *Pav. mss. in Herb. Berol.; De Cand. Rev. Big.* 1838.

Bignonia fulva, *Pav. Icon.* vi. p. 672, *t.* 580.

Bignonia Meyeniana, *Schauer, in Nov. Act. Nat. Cur.* xix. *Suppl.* i. p. 366; *De Cand. Prod.* ix. p. 563.

Bignonia alata, *Pav. Herb. teste De Cand.*

Bignonia Guarume, *Domb. Herb.?*

GEOG. DISTR. Andes of Peru (*Warszewicz! Besser! Ruiz!*), Tarma and Ica, Peru (*Maclean!*), Arequipa (*Lord Colchester!*), Arica (*Lord Colchester!*), Arica, Iquique and Cobija (*Cuming!, n.* 932), Bolivia (*Pentland!*), Tacna (*Meyen! Lechler!, n.* 1566). Cultivated in Europe.

2. TECOMARIA *rosæfolia;* fruticosa, ramulis teretibus; foliis calycibusque floccoso-puberulis vel hirsutis, demum glabris; foliis oppositis pinnatis 3–5-jugis cum impari vel trifoliolatis, petiolo communi inter juga angustissime marginato, foliolis breviter petiolulatis oblongis utrinque acutis vel apice obtusis serratis; racemis terminalibus paucifloris; calyce campanulato 5-nervio, nervis subcostatis in dentes 5 acutos desinentibus; corolla clavato-tubulosa leviter curvata (incarnata), lobis rotundatis ciliatis, extus glabra, intus versus basin villosa; staminibus infra medium tubi inserta, filamentis basi pilosis, antheris stylo ovarioque glabris, capsula (4–5 poll. long., 2–3 lin. lat.) glabra (v. s. sp.).

Tecomaria rosæfolia, *Seem. mss.*

Tecoma rosæfolia, *H. B. K. Nov. Gen.* iii. p. 143; *De Cand. Prod.* ix. p. 224.

Tecoma azaleæflora, *H. B. K. Nov. Gen.* iii. p. 142; *De Cand. Prod.* ix. p. 224; *G. Don, Gen. Syst.* iv. p. 224 (ex err. typogr. "azaleæ*folia*").

Bignonia rosæfolia, *Willd. Herb. n.* 11,466.

Bignonia tenuiflora, *De Cand. Prod.* ix. p. 166.

Nomen vernaculum Peruvianum: *Fresnillo*, teste Humboldt, sched. in Herb. Willd.

GEOG. DISTR. Chillo, Ecuador (*Humboldt and Bonpland!*), Chachapoyas (*Mathews!, n.* 1339), Sondorillo (*Humboldt and Bonpland!, n.* 3545), Bolivia (*Bridges! in Herb. Bentham*).

Tecoma rosæfolia and *T. azaleæflora* proving identical, and being published simultaneously, I have chosen the name 'rosæfolia,' as the leaves look more like those of a Rose, than the flowers like those of an Azalea.

3. TECOMARIA *Capensis*; fruticosa, ramulis teretibus glabris; foliis oppositis pinnatis 2–5-jugis cum impari, petiolo communi aptero, foliolis breviter petiolulatis ovatis vel subrotundatis obtusis vel acuminatis, basi cuneatis, serratis, supra glabris, subtus pallidioribus, axillis venarum barbatis; racemis terminalibus multifloris; calyce campanulato 5-nervio, nervis subcostatis vel vix conspicuis in dentes 5 acutos desinentibus, corolla clavato-tubulosa leviter curvata (aurantiaco-coccinea), lobis oblongis obtusis, extus glabra, intus versus basin villosula; staminibus infra medium tubi insertis, filamentis antheris ovario styloque glabris, capsula (5–6 poll. long., 3 lin. lat.) glabra (v. s. sp. et v. cult.).

Tecomaria Capensis, *Fenzl, in Herb. Vindob.*

Tecoma Capensis, *Lindl. Bot. Reg. t.* 1117; *De Cand. Prodr.* ix. *p.* 223.

Bignonia Capensis, *Thunb. Prodr. p.* 105 (*sed in Fl. Cap. omissa*).

Tecomaria Petersii, *Klotzsch, in Peters' Reise nach Mozambique (Botanik), p.* 192.

Tecomaria Krebsii, *Kl. mss. in Herb. Berol.*

GEOG. DISTR. Cape of Good Hope (*Ecklon! Bergius! Krebs!*), Zneuwbergen, South Africa (*Drége! Masson!*), Delagoa Bay (*Forbes! Peters!*), Uitenhage (*Herb. Hook.!*), Port Natal (*Krauss! n.* 236, *Sanderson!*), all along the coast of Lower Albany (*Athurton!*), Island of Dominica, West Indies (*Imray!*), North of Macahé, Brazil (*Miers!*), Madras (*G. Thomson!*), Mercara (*Hohenacker! n.* 523). Cultivated in Europe.

When normally developed, the flowers have five lobes. I have not altered the specific name, "*Capensis*," although I believe it not to be a native of that country, and for the following reasons, previously published in Gard. Chronicle for 1860, p. 4, and 'Bonplandia,' 1860, p. 1:—

It is well known that a number of Australian, American, Asiatic, and European plants have become perfectly naturalized, and to all appearance wild, at the Cape of Good Hope. Even our first steps on the soil of South Africa show us the hard struggle of the children of the native Flora with foreign intruders. Gigantic Gum-trees of

Australia, spiny Cactuses and Agaves of America, English Oaks, and Scotch Firs, accompanied by a long train of weeds bent upon the spread of cosmopolitan principles, and a numerous list of cultivated plants, endeavour to establish themselves in every direction, and deprive the original inhabitants of their legitimate inheritance. In most cases there would be no difficulty to prove from historical and geographical records the origin of these foreign elements, but in some it is extremely difficult to decide what is foreign and what native. To the latter category belongs *Tecomaria Capensis*, Fenzl,=*Bignonia Capensis*, Thunb., a well-known garden plant. At present it is found in South Africa, the East and West Indies, and Brazil; and the question now arises, which of these is to be regarded as its native country? Thunberg, who first introduced it into science, mentions it in his 'Prodromus,' but not in his 'Flora Capensis.' Whether in the latter work it was omitted by mistake or on purpose (perhaps because the author had become convinced that it was not a Cape plant?) cannot, in the absence of every allusion to the fact, now be decided. In order to find out its real native country, no other means are left but to look for its nearest allies, and these do present themselves, not in *Rhigozum trichotomum* and *R. obovatum* or *Catophractes Alexandri*, the only three *Bignoniaceæ* inhabiting Southern Africa, but in two species of *Tecomaria* indigenous to the lower portion of South America, viz. *T. fulva* (=*Bignonia fulva*, Cav.) and *T. rosæfolia* (=*T. azaleæflora*, H. B. K., *Bignonia tenuiflora*, De Cand.). Both share with *Tecomaria Capensis* the tubular corolla, the exserted stamens and styles, and the habit, for *T. Capensis* is not a climber, as is often stated, but an erect shrub. Now, as all species of *Tecoma* and allied genera with erect stem and digitate and imparipinnate leaves are confined to America, we are not justified in assuming *T. Capensis* to be an exception; and what would be calculated to strengthen this argument is the fact that the plant has been found wild in Brazil, so that if we had first received it from there, we should in all probability never have entertained any doubt about its native country.

Some years ago, when examining the herbarium of my learned friend Mr. Miers, I observed a plant from Brazil which I took for *T. Capensis*. Afterwards, when examining the genus to which it belongs more closely, I obtained a specimen for comparison, and found it perfectly dentical with the *Tecoma Capensis*.

"This plant," writes Mr. Miers, "was found by my son in travelling across the country inland from Macahé, a small port in the province of Rio de Janeiro, in lat. 22° 20′ S. . . . I have also the closely allied *T. rosæfolia*, collected by Mathews in Chachapoyas, on the eastern slope of the Peruvian Andes, near the main tributary of the Marañon, far in the interior, and at a considerable elevation, and therefore not in the least degree to be suspected of being introduced from Africa. This confirms my belief that my plant from Brazil is a truly indigenous species." The occurrence of *T. Capensis* in the West Indies is restricted to the island of Dominica, where Imray collected a specimen, preserved in Sir William J. Hooker's herbarium. I have seen no other West Indian specimens, and am inclined to think that Imray's plant, even if it should be apparently wild, must be a fugitive of some garden. In the East Indies, the species under consideration was collected at Madras by G. Thomson, and at Mercara by Hohenacker, but in both places it has become merely naturalized, as *Tecoma stans* and a few other *Bignoniaceæ* have also become in various parts of tropical Asia. In Delagoa Bay, it was gathered by Peters, probably also naturalized, and from the Cape of Good Hope we have it from almost every collector; whilst in the gardens about the Mediterranean it is one of the commonest plants, and often escapes from them.

At first sight it would appear that the question respecting the native country could easily be settled by assuming the species to be endemic to both Africa and America, were it not opposed to the fact that all *Bignoniaceæ*, notwithstanding their winged seeds, have a limited geographical distribution, and that no species, as far as we know, has been claimed as a citizen of both hemispheres. We should therefore be compelled to assume in this case an exception to that rule, and ignore all the arguments that tend in a different direction; for if we consider that the two nearest allies of *Tecomaria Capensis* are genuine members of the American Flora, that *T. Capensis* has been found wild in portions of America inhabited by them, and that the native country of no known *Bignoniacea* is extended over both hemispheres, we can scarcely escape the conclusion that *Tecomaria Capensis* is a native of South America, and is only naturalized in South Africa and Asia.

MEMORANDA.

The Sago-Palm of the Aru Islands, New Guinea.—The staff of life in these islands is sago. A good-sized sago-palm will give 1800 cakes of three to the pound, of which five are the ordinary quantity consumed by a man in a day. Hence a single tree may be considered equal to the support of a man throughout the year. The labour to prepare the food is as follows:—Two men, working moderately, will finish a tree in five days, and two women will bake the whole in about five days more; so we may estimate that, with ten days' labour, a man may produce food for a whole year. This is, if he possesses trees of his own; for all the sago-palms are become private property, and cost about 9*s*. each. Again, the cost of labour being 4*d*. a day, and the cost of the tree 9*s*., the expense of one year's food for a man is only 12*s*.—*Wallace, in Proceedings of the Royal Geographical Society.*

New British Algæ.—Mrs. Gatty, in the Appendix to 'British Seaweeds, drawn from Professor Harvey's Phycologia Britannica,' just published, mentions five species of Algæ not before noticed as inhabitants of the British Islands:—1. *Elachista Haydeni*, parasitic on *Asperococcus echinatus*, *Chorda Lomentaria*, and *Punctaria plantaginea*, found at Filey Bridge by the Rev. T. W. Hayden, 1862. 2. *Rytiphlœa oxyacantha*, Harvey, ms. Dr. Harvey now considers this as a variety of *R. thuyoides*, discovered by Miss Turner in Jersey, 1855. 3. *Polysiphonia fœtidissima*, Cocks' 'Algarum Fasciculi.' This is regarded by Dr. Harvey as a variety of *P. fibrata*. 4. *Dasya punicea*, Agardh. This interesting addition to the list of British seaweeds resembles Agardh's Greek species *D. punicea* so closely, that Dr. Harvey believes it may be the same, although differing in one particular character, viz. in the length of the joints of the branchleteens; those of Agardh's being short, and the present form long. Discovered by Mrs. Gray at Bognor, Sussex, 1858, and 1859 by Mrs. Merrifield at Brighton. We may add, that Mrs. Gray collected the plant at Bognor in October, 1855, and sent it to Dr. Harvey in 1858; hence the later date is given. 4. *Dasya Catloviæ*. "A form not yet described, from the fact that only one specimen, and that a barren one, has as yet been found. It was discovered floating in St. Aubin's Bay, Jersey, in August, 1858, by Miss M. Catlow. Externally it bears some likeness to an Australasian species, *D. Gunniana*; but its characters come nearest to those of the Mediterranean species, *D. punicea*, above described as having been lately found on the British shores. Dr. Harvey considers *D. Catloviæ* more robust, however, and its branchleteens more generally distributed, and is inclined to think it may prove a distinct species." 5. *Naccaria hypnoides*, Agardh. St. Catherine's Bay, Jersey, Miss Turner and Mr. Girdlestone; Exmouth, Mrs. Gulson.—*J. E. Gray, Brit. Mus.*

Common Ling (Calluna vulgaris) in Massachusetts.—That "America has no Heaths" is a botanical aphorism. It is understood, however, that an English surveyor, nearly thirty years ago, found *Calluna vulgaris* in the interior of Newfoundland; also that De la Pylaie, still earlier, enumerates it as an inhabitant of that island. But this summer, Mr. Jackson Dawson, a young gar-

dener, has brought up specimens of living plants (both flowering stocks and young seedlings) from Tewkesbury, Massachusetts, where the plant occurs rather abundantly over about half an acre of rather boggy ground, along with *Andromeda calyculata*, *Azalea viscosa*, *Kalmia angustifolia*, *Gratiola aurea*, etc., apparently as much at home as any of them. . . . It may have been introduced, unlikely as it seems, or we may have to range this Heath with *Scolopendrium officinarum*, *Sabularia aquatica*, and *Marsilea quadrifolia*, as species of the Old World so sparingly represented in the New, that they are known only at single stations,—perhaps late-lingerers rather than new-comers.—*Asa Gray, in Silliman's Journ.* xxxiii. (1861) 290.

Arum Canariense for making Arrow-root.—We noticed in the Annual Report of the Acclimatization Society a short notice of an *Arum* suited for making arrow-root and producing lucrative returns to the cultivator. As considerable doubt existed as to the correct botanical name of the plant, we applied to H. M. Sheriff, in Guernsey, and received a specimen which Dr. Schott, of Vienna, the greatest authority on *Aroideæ*, declared to be *Arum Canariense*, peculiar to Madeira and the Canary Islands, but hitherto unknown to him from the Azores. We further learn from Mr. Martin's letter, dated Guernsey, Jan. 6, 1863, that he made about three hundred pounds of arrow-root last summer, and that the *Arum Canariense* is now perfectly naturalized in Guernsey; also that he forwarded roots to the Crystal Palace Company, the Kensington Museum, and the Acclimatization Society.

"This *Arum*," says Mr. Martin, "was introduced by me into the island of Guernsey, and I have been cultivating it for the last seven years. It first came under my notice through the means of a plant brought in a pot from the Azores, and given to a brother-in-law of mine, as a plant producing arrow-root. I at once determined to try its powers of enduring our climate; and I have found it perfectly hardy, bearing well the severest of our winters. Growing, however, the winter through, it required the shelter of a walled garden, or land otherwise protected from high winds, which break the leaves and thus retard its growth. The digging of the crop and the replanting takes place at the end of July or commencement of August. It might be done simultaneously, the smaller corms being planted as they are separated from the larger ones destined for arrow-root. They, however, can remain out of the ground for some weeks —a longer time if kept quite dry. In planting, I have, after repeated trials of various modes, adopted the following. I dig a trench as for potatoes, but levelling the bottom with the spade, so as to have a level surface of about six inches in breadth and as much as possible of uniform breadth; then drop into this furrow very thickly the small corms. These latter, though not attaining the size of the larger ones, will yet acquire a respectable size. I lay them thick for two reasons: one is that many of the corms will not grow the first year, and the second is that it has become evident to me that the corms, on increasing their size, require the assistance of each other to get the better of the pressure of the soil, which, after winter rain, gets hard. Between each row I leave a space of eighteen inches, or, when I plant in very rich soil, two feet. The corms so planted, I leave two years before taking them up. A crop may, how-

ever, be obtained yearly by planting corms of the size of a good-sized egg; but I prefer the other mode. At the second year, the plants not having been disturbed, are up much earlier, and become much finer and healthier plants than those planted one year for the other, and produce much finer corms for the next planting. To obtain a first-rate crop, the soil needs to be rich and well manured. If this is done at the time of planting, the more rotten and decayed the manure is, the better. If, however, you prepare your soil early the previous spring, you can turn in manure in its ordinary state. The manure in all cases is spread upon the soil and forked in.

"This plant seems to delight, like our common *Arum maculatum*, in rich vegetable mould; and, like it, seems to do best in large clumps or close patches. This was what first suggested to me the propriety of planting thick. The produce of this plant is enormous; from 1½ perch I manufactured one year sixty pounds of arrow-root, which I sold at the rate of 1*s*. per pound, being at the rate of £78 per Guernsey vergée, or £193 sterling the English acre. This was planted with corms the size of an egg, in rows one foot apart and three inches in the rows. That was a remarkably good year for bringing the plants to perfection; I have never succeeded so well since. It has never failed, however, in paying me well for the ground it occupied, and the labour required by it. In some years it has been attacked with a disease peculiar to the plant. Early in spring I have found the leaves and stalks acquire a rusty appearance, and this gradually spreading, until the plant disappeared altogether. On digging the corm, it was perceived that it had stopped its swelling from the time of attack. I have observed this same disease in the common *Arum*, and in *Arum Serpentaria*, which I have also in my garden.

"With regard to the extraction of the fecula, this operation is performed just in the same way as potato-starch is obtained, and therefore does not need any particular explanation here. There resides in this, as well as in the common *Arum* of our hedges, an acrid principle, which would make it very dangerous if eaten in its undried state. By drying, however, its poisonous qualities entirely disappear by evaporation, and in this state it becomes really superior to the potato. This has led me to believe that if this root was kiln-dried, it might afterwards be stored and used as potatoes the winter through. I have not yet, however, made the experiment, save with a few roots dried before a fire, and so far proving perfectly successful."

NEW PUBLICATIONS.

Handbook of the British Flora. By George Bentham, F.R.S. With Engravings from Original Drawings by W. Fitch. Part I. Reeve and Co.

English Botany. Third edition: revised by J. T. Boswell Syme, F.L.S., with Popular Descriptions by Mrs. Lankester. No. 1. Hardwicke.

A person unacquainted with the opinions of living botanists as to the

limits of species would be at his wits' end were he to examine and compare the two works quoted above. Both purport to be first instalments of complete British Floras, that will contain descriptions and figures of every species of our native plants. On comparing them, however, as far as they can be compared together, we find that the first eleven species of Mr. Bentham's book are represented by no less than twenty-three in Mr. Syme's. The authors have evidently very different opinions as to what is a species. The man who would so define that which constitutes a species as to be clearly understood and universally received, would perform for botany a service second only to that of Linnæus when he invented his binominal nomenclature. But is it possible to give such a definition? The long-accepted opinion that species have an existence in nature may be an error, notwithstanding the many plausible reasons that are adduced in support of it. We may be obliged to accept the modern notion that a species is nothing more than a subjective realization of the systematist, whereby he unites under a single name a group of individuals which have certain characters in common. But if he is governed in his grouping by any general principles, the expression of these would define his notion of a species. It is different, however, with the disciples of the modern school of development, whose least fault seems to be the upsetting of species as an objective or a subjective reality in natural history; for if all the members of a species are in a condition of never-ceasing progression,—if everything is changing into something else,—then that definition which to-day made only the one species, may to-morrow, from the same materials, make many. Yet this change, if it exist, may be so slow as to be inappreciable to botanists, say, of any particular century, or even to the whole human race. We have observed that the relations of style to stamens in *Primulæ* gathered 220 years ago are the same as those of the present day, so that though they were then "tending towards a dioicous condition," and have been ever since, nature has been unable to help on this transformation, even to the smallest extent, during that period. Nor has this subtle power been able, according to Dr. Heer, to making anything of *Pinus Abies*, L., during the long period that has intervened since its leaves, branches, and fruit were spread out in the clays of Bacton during the Upper Pliocene period, except the unchanged *Pinus Abies*, L.

Darwinians, then, or not, it comes to the same thing,—species, what-

ever may be their origin, are not at present being manufactured; they are, as far as we, our ancestors, or our successors are concerned, permanent realities; so that it is not beyond the possible that some master in science may give us a definition of a species that will be universally accepted. The difficulty is not, as Mr. Syme clearly puts it, whether certain groups or forms exist which are more or less separable and definable by characters, but do these groups deserve to be called species? The diversity of opinion on this point has divided modern botanists, as is well known, into two schools—the one, the "lumpers," uniting allied though permanent "forms" under one specific name; while the "splitters" consider the existence of permanent characters, even though they are not very striking, as sufficient grounds for considering the same "forms" as species. Mr. Bentham belongs to the first school, while Mr. Syme is a cautious "splitter."

The 'Illustrated Handbook' is intended for the use of beginners and amateurs, and Mr. Bentham has produced a manual which can be easily used by such persons. We say, has produced, for the text is scarcely altered from his published 'Flora,' which has now been before the public for five years; the only change worth notice in the part before us is the recognition of *Ranunculus hederaceus* as a species. The dichotomous arrangement characteristic of the work is of great practical value to persons who, without any previous knowledge of botany, desire to name the plants they notice in their country walks. By using plain language, by happily fixing on striking contrasting characters, and by uniting allied "forms" under one specific name, the author has made the naming of British plants, according to his system, a very easy matter. We doubt whether the illustrations will be much help to the tyro. Perhaps our opinions are influenced by a long-entertained notion that drawings of the various plants of a country executed of a uniform size, without respect to their different magnitudes, are apt to mislead, and must almost invariably do so if they are greatly reduced. Given, however, a block of wood two inches by one and a half to figure the Hellebore or the Mousetail, we cannot conceive of their being done better, on the whole, than the cuts executed from Mr. Fitch's drawings. Small though they are, the habit of the plant is frequently caught, and there is a vigour, freedom, and truth in them that we do not remember in any similar cuts. It must have been occasionally a difficult matter for the artist to obtain a plant that would agree with the written de-

scription. Take, for instance, the only aquatic Ranunculus with submerged leaves; who could say what "form" has been used in making the drawing? The details of fruit, etc., generally given, have been judiciously omitted; it was a bold step to venture on a petal which would suit equally the small form of *R. trichophyllus* and the large one of *R. peltatus*. We would suggest that the various details crowded into the small cuts should in some way be named; at present they must puzzle tyros.

Whoever pays more than a passing attention to botany will inevitably seek for more extended information than he can find in Mr. Bentham's 'Handbook.' To him the work of Mr. Syme will be welcome, for while he carefully observes and gives their right position to permanent forms, he is yet cautious in admitting what may be nothing more than temporary, local, or other accidental varieties. He avoids, on the one hand, the extreme views advocated by some French botanists; and on the other, the wholesale lumping of well-marked "forms" favoured by a few deservedly eminent botanists. In his preliminary remarks, Mr. Syme states his views on the value of different groups inferior to the genus. He approvingly quotes the opinion and names given by Mr. Watson in the fourth volume of the 'Cybele,' where he proposes the term 'ver-species' for the well-defined and generally adopted species; 'sub-species' for more obscure groups, where the distinctions between themselves are slighter, less generally recognized, or apparently graduating into each other; and 'super-species' for a group of allied sub-species. Mr. Syme, we think, wisely adopts these views in his work; he considers those plants as sub-species "which have less strongly marked differences between them than are found between generally received species, but which are, nevertheless, too constant in their characters to be considered merely varieties. Such plants have recently attracted much notice from many Continental and a few of our own botanists; and though their efforts have sometimes been stigmatized as species-making, we are indebted to them for a much more accurate knowledge of plants than we previously possessed." The term 'variety' he applies "to forms which are, or are supposed to be, confined to individuals, and which may revert to the original type in a single or a few generations." As an illustration of the practical application of these views, we may adduce *Thalictrum minus*, L., which he makes a super-species, including the two sub-species, *T. eu-minus*, with its

varieties, *a, maritimum*, plate iii., and *β, montanum*, plate iv.,—and *T. flexuosum*, Bernh., plate v.

We regret that the letterpress, which is entirely new, containing important critical information here published for the first time, and evidently the result of much study, is not associated with a series of new drawings. It is not to the credit of English botany, that such works as those of Sturm, Nees, and Reichenbach, can be carried on simultaneously in Germany, while, in 1863, the best illustrations of British plants are a reproduction of plates some of which were published as long ago as 1790. But were we to stop here, we should convey a very erroneous impression of the figures. They are evidently printed from stone; and in transferring from the plate, so many alterations and additions have been made under the superintendence of Mr. Syme, that it is sometimes difficult to recognize the plate of the original Sowerby. The introduction in this way of a series of fruits, so useful in the determination of the *Ranunculaceæ*, of roots and radical leaves, and of other important characters, bring the published figures up to our present state of knowledge, and incorporate the most recent observations in systematic botany. The number of new plates in the first part, no less than eight out of the twenty-four, surprises us. The faulty figure of *Thalictrum alpinum* has been replaced by a very characteristic drawing. An original and accurate plate of *Thalictrum minus*, var. *a. maritimum*, is given, as also of *Ranunculus heterophyllus*; while *Ranunculus peltatus*, var. *vulgaris* and var. *floribundus*, *R. Drouetii*, *R. trichophyllus*, and *R. Baudotii*, are figured for the first time as British plants, the plates being those intended for the fifth volume of the 'English Botany Supplement,' and published here in anticipation of that volume.

Much has yet to be done before anything like a complete history of our plants can be written; those who accept Mr. Syme's views, and, influenced by them, examine our British plants and record their observations, will help on such a desirable consummation. How little do we know of the history of the various species—of their different appearances at the various stages of their life—of the geographical distribution of allied 'forms'—of the influence of soil, moisture, climate, etc., on these 'forms,'—and many similar questions! With definite information, it will be an easier matter to determine the value of allied forms; and it is our hope that the pages of our Journal will be, month

after month, by the help of observers throughout the country, the medium of publishing such information.

We somewhat like the plan of re-introducing popular matter into our systematic works. In the good old days of Gerarde and Johnson, the only botanical publications were those which treated of the uses of plants. It has perhaps tended to make the study less popular, that manuals of botany have been hitherto so strictly scientific. Mrs. Lankester may make this new feature an attractive as well as instructive portion of the work.

We must defer examining Mr. Syme's descriptions and critical observations in detail, only saying further that this work, if carried on as begun, will be the most important contribution made to British botany since the completion of Sowerby's great work in 1814. No working botanist should be without it.

BOTANICAL NEWS.

London, February 1.—Mr. Milne, the botanical collector of Captain Denham's voyage of H.M.S. Herald, has sailed for the West Coast of Africa, to explore the country around Old Calabar and the Cameroon Mountains.

The Herbarium of the late W. Borrer, Esq., F.R.S., F.L.S., that deeply lamented botanist, and, if possible, still more excellent man, is now placed in the Royal Gardens at Kew. It is probably the best British herbarium in any public collection, for Mr. Borrer's great botanical attainments, his personal acquaintance with almost every part of Great Britain, and his readiness to assist even young students, made him loved by almost every one, and the result of all this was, that scarcely any new plant was added to the British flora, for many years, without his being consulted, and specimens falling into his hands. The portions of this herbarium we have had the privilege of seeing, lead us to expect that it is rich in critical species, and full of valuable notes on them, more especially in the circumstances under which he gathered the more doubtful plants of our flora, whose claims to be included in our lists must, we suppose, be finally settled by the observations he has made. As is the case with all herbaria gradually formed during a long course of years, the names found on Mr. Borrer's tickets may perhaps not be those which he ultimately adopted; but every one, at all accustomed to examine plants carefully, instinctively makes allowance for cases like these. The whole collection will ever be a monument of his deservedly high position; for his botanical publications, though always of great merit, were too few to manifest sufficiently

the prominent position he occupied amongst the most valued botanists of his time.

Animated by feelings of piety, a friend of the late Robert Brown, Dr. Boott, has placed over the chimneypiece of the back room of 17, Dean Street, Soho, (now occupied by an upholsterer,) a tablet bearing the following inscription:—"This room, the library, and the adjoining one, the study, of the Right Honourable Sir Joseph Banks, Baronet, President of the Royal Society, and, after his death, of Robert Brown, Esq., F.R.S., Foreign Associate of the Academy of Sciences and the Institute of France, were for nearly seventy years the resort of the most distinguished men of science in the world, the last assemblage of whom was on the occasion of the funeral of Mr. Brown, who expired on the 10th of June, 1858, in the eighty-fifth year of his age."

The Herbarium of John Ray is still in existence. It was bequeathed by him to his friend Samuel Dale, apothecary, at Braintree, who was about forty-five years old at the time of Ray's death (1705), and survived him till the year 1739, when he left his books and plants as a legacy to the Apothecaries' Company. Suitable presses were erected for their conservation at Chelsea Gardens, under the direction of Sir Hans Sloane. Isaac Rand, the assistant, and in the end the successor to Petiver, as botanical demonstrator to the company, was officially connected with the gardens for more than twenty years before Dale's herbarium was deposited there. He was then making an extensive *hortus siccus*, which at his death was placed along with those of Ray and Dale. These three herbaria, containing collections of British and foreign plants, with the Rayan names attached, have remained ever since in suitable presses until lately, when, through the exertions of the Keeper of the Botanical Department of the British Museum, seconded by N. B. Ward, Esq., one of the Court of the Apothecaries' Company, they have been secured for our National Herbarium. The herbarium of Ray—certainly the most interesting memorial existing of that great and good man—is contained in 19 thin quarto or small folio fascicles, each characterized by a letter of the alphabet. The plants, most of them still in excellent condition, are sewn on the paper, and labelled in the peculiarly neat and plain handwriting of Ray. They are put together apparently without order, probably as they were collected. Accompanying them is a manuscript index, also in Ray's handwriting; it is entitled "Horti Sicci Raiani Catalogus," and contains an index to the fascicles as far as letter S, arranged alphabetically, in this manner, "Cyclamen autumnale hederæ folio, K. 4, M. 5, O. 8, S. 6." There are besides a separate collection of Grasses carefully named, and a few bundles of loose plants. The importance of this collection in determining precisely what are Ray's species cannot be over-estimated; and with those of Dale and Rand, both of whom helped Dillenius in his edition of Ray's 'Synopsis,' added to the collections of Sloane, Petiver, Sherard, Buddle, Richardson, and others, already in the British Museum, will supply ample materials to the Committee of the British Association, consisting of Dr. Gray, Prof. Babington, and the Rev. W. W. Newbould, to prepare a valuable report on 'The Plants of Ray's Synopsis Stirpium' as determined by an examination of theoriginal herbaria of Ray and others.

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PODOCARPUS VITIENSIS, A NEW CONIFEROUS TREE, FROM THE VITI ISLANDS.

By Berthold Seemann, Ph.D., F.L.S., F.R.G.S.

(Plate II.)

My principal reason for publishing this plate, is to obtain, if possible, more complete materials of the plant than I was able to collect. It is one of the finest *Coniferæ* I have ever seen, and in habit so unlike any other, that I am convinced we have here a new genus, closely allied, but different from *Podocarpus*, with which genus I have provisionally placed it. That was also the conviction of Professor Parlatore, who is now working up the *Coniferæ* for De Candolle's 'Prodromus.' Mr. Bennett has well remarked (Plantæ Javan. p. 35) that the seeds of *Podocarpus* are always roundish; but they are here ovate-acuminate, and moreover, unlike those of *Podocarpus*, they are equilateral, showing that they must be attached in a somewhat different manner. Unfortunately, I have nothing of the seeds but the inner bony integument, the outer fleshy one having rotted away when the seeds were picked up under the tree. Under such circumstances it will be best not to attempt at present the establishment of a new genus.

The tree is found in the island of Viti Levu, where the natives term it "Kau solo." It attains sixty feet in height and nine feet in circumference, produces timber of the first quality, and has drooping, extremely graceful branches, which would render the plant a highly desirable acquisition to our hothouses. I subjoin a brief description.

Podocarpus? (Dacrycarpus?) *Vitiensis*, Seem. in Bonpl. x. p. 366 (Tab. Nostr. n. 2); arbor excelsa, ramis teretibus brunneis; foliis omnibus distichis ovato-lanceolatis vel subellipticis, acutis vel obtusiusculis, 1-nerviis, supra viridibus subtus pallidioribus, utrinque stomatiferis, nervis in petiolum adnatum decurrentibus; amentis . . .; seminibus æquilateralibus ovato-lanceolatis (v. v. sp.).

Nomen vernaculum Vitiense: *Kau solo.*

Hab. In insula Viti Levu (*Milne! Seemann, n.* 576).

Explanation of Plate II.

Podocarpus? Vitiensis, Seem.—Figs. 1 and 2. Portions of branchlets, magnified. 3 and 4. Seed, without the outer integument, both the natural size. 5. A longitudinal section of a seed, slightly magnified.

I may add to this description the diagnosis of seven new *Coniferæ* just received from Professor Parlatore, of Florence :—

1. JUNIPERUS *conferta*, Parlat. ; ramulis brevibus ; foliis ternis, imbricatis, curvulis, patulis, rigidis (12-16 mill. longis, $1\frac{1}{4}$–$1\frac{1}{2}$ mill. latis), subtriquetris, supra canaliculatis et sulco longitudinali albido notatis, subtus convexo-carinatis et juxta carinam utrinque sulco levi notatis, apice mucronato-pungentibus ; galbulis prope apicem ramulorum sitis, globosis (9–10 mill. longis et latis, fusco-cœruleis), glaucedine tectis ; squamarum apiculis obliteratis.—In Japonia legit C. Wright (in Herbario Hookeriano). A *Junipero rigida* foliis crassioribus, confertioribus, magis triangularibus et galbulis majoribus, exacte globosis (non apice elevato-triquetris) et levibus omnino distincta.

2. FRENELA *sulcata*, Parlat. ; ramulis crassiusculis, erectis, alterne triquetris, ramulorum foliis maxima ex parte adnatis, linearibus, dorso carinatis et sub vitro punctulato-tuberculatis, apice adpresso, obtusiusculo, strobilis in ramulo longiusculo tenui erectis, depresso-subglobosis (12–13 mill. longis, 9–10 mill. latis) ; squamis subæqualibus, erectis, oblongo-lanceolatis, triquetro-pyramidatis (8–10 mill. longis, $3\frac{1}{4}$–$3\frac{1}{2}$ mill. latis) dorso profunde sulcatis, apice acutiusculis, infra apicem gibboso-apiculatis, apiculo apicem bracteæ adnatæ referente obtuso, subreflexo ; nuculis ovato-subrotundis, acute triquetris, ala angusta, alba.—In Nova Caledonia (in Herbario Hookeriano) ab omnibus *Frenelæ* speciebus squamis subæqualibus et dorso profunde sulcatis satis superque distincta. In ipso locupletissimo herbario aliam *Frenelæ* vel fortasse novi generis speciem, ob folia quaterna ramulosque subumbellatos et alterne tetragonos certe singularem, vidi, sed florum fructuumque in specimine defectu de ejus generis cognatione affirmare non audeo.

3. FRENELA *subcordata*, Parlat. ; ramis teretibus ; ramulis crassiusculis, flexuosis, alterne triquetris ; ramulorum foliis maxima ex parte adnatis, linearibus, dorso obtuse carinatis, lævibus, apice libero, adpresso, acutiusculo ; strobilis in ramulo brevi crasso erectis, subcordato-globosis, angulatis (fuscis), opacis, magis latis quam longis (14–16 mill. longis et 16–18 mill. latis) ; squamis basi subcanaliculatis, dorso rugulosis, infra apicem crasse mucronatis, paulo inæqualibus, 3 majoribus cordato-ovalibus, obtusis (14–15 mill. longis, 10–11 mill. latis), 3 paulo brevioribus et angustioribus, cordato-lanceolatis, acutiusculis (12–13 mill. longis, 7 mill. latis) ; columna triquetra, squamis duplo breviore, obtusissima, nuculis late bialatis, ala alterna valde majore.—

In Nova Hollandia austro-occidentali prope *King George's Sound* legit Cl. Baxter. Strobilus fructum *Callitris* quadrivalvis quodammodo referens, sed e squamis 6, ut in *Frenelis*, compositus. Ab omnibus hujus generis speciebus insigniter diversa.

4. Frenela *Drummondii*, Parlat.; ramis teretibus; ramulis crassiusculis, erectis, alterne triquetris; ramulorum foliis linearibus, maxima ex parte adnatis, dorso convexo-carinatis, levibus, apice libero, adpresso, obtusiusculo, scarioso; strobilis in ramulo crasso valdeque apicem versus incrassato et strobilum ipsum subæquante erectis, solitariis oppositisve, subglobosis (castaneis), nitidis, magis latis quam longis (12–13 mill. longis, 14–15 mill. latis); squamis paulo inæqualibus, 3 majoribus, oblongis, obtusis (12–13 mill. longis, 7–8 mill. latis), 3 minoribus (11–12 mill. longis, 5½-6 mill. latis), omnibus dorso lævibus, basin versus angulosis, infra apicem brevissime mucronulatis, nuculis late alatis, ala fusca.—In Nova Hollandia austro-occidentali ad Cygnorum flumen legit Cl. J. Drummond.

5. Actinostrobus *acuminatus*, Parlat.; ramis teretibus, rufescentibus, ramulisque strictis; foliis subtriquetris, ternis, basi adnato-decurrentibus, superne liberis erecto-patulis, linearibus, mucronato-pungentibus (usque ad basin 7–8 mill. longis, 1½ mill. vix latis), supra planiusculus, subtus carinato-convexis, marginibus scabris; foliis ramulorum superiorum inferne longo tractu adnatis, apice libero, vix patulo, mucronato-pungente; strobilis in ramulo strobilo ipso breviore erectis, ovato-acuminatis, basi bracteis pluribus, ovoideis, acute mucronatis tectis (15–18 mill. longis, 12–14 mill. latis); squamis 6, æqualibus, basi connatis, erectis, oblongis, apicem versus angustatis et patulis, ibique acuminato-mucronatis, intus angulatis (castaneis); columna centrali brevissima; nuculis cordatis, tripteris vel dipteris, ala tenui, lata, squama plus quam duplo brevioribus.—In Nova Hollandia occidentali inter flumina Moore et Murchison legit Cl. J. Drummond, ann. 1853. Ab *Actinostrobo pyramidali* differt ramis ramulisque strictis, foliis longioribus et apice minus patulis, strobilis ovoideis, acuminatis, bracteis acutis, squamis longioribus apice patulis, columna centrali brevissima (non squamis duplo breviore), aliisque notis.

6. Larix *Lyallii*, Parlat.; coma pyramidali; ramis subhorizontalibus (fuscis); ramis annotinis lanato-arachnoideis, canescentibus; ramulis gemmiferis ovali-globosis, perulis brevissimis, imbricatis, rotundatis (fuscescentibus), margine longe fimbriato-arachnoideis; foliis nu-

merosissimis (40–50 in quoque fasciculo, 22–33 mill. longis, $\frac{1}{2}$–$\frac{2}{3}$ mill. latis), utrinque subcarinatis, obtusiusculis, curvulis, erecto-patulis, molliusculis; amentis masculis oblongis, obtusis (8–10 mill. longis, 4 mill. latis), primum subsessilibus, dein pedicello breviusculo munitis, basi perulis latiusculis, obtusis, fimbriatis cinctis; amentis fœmineis reflexis, oblongis, obtusiusculis (4–5 cent. longis, 2 cent. fere latis); bracteis late ellipticis, margine apicem versus crenulatis (castaneo-fuscis), nervo medio dilutiore in cuspidem longam, subulatam, patulam, squama multo longiorem producto; squamis subcartilagineis, suborbicularibus, apice submarginato et margine longe fimbriatis, nervis validis a basi fere ad apicem radiatim notatis; nuculis parvis, ala squamam subæquante.—Ad latus orientale montium Americæ boreali-occidentalis, *Cascade Mountains* et *Galton Ranges*, *Rocky Mountains*, latitudinis 49 borealis, 2100 et 2300 m. elevationem supra mare, legit Cl. Lyall, qui mihi benevole speciem hanc communicavit. Stirps ob ramorum annotinorum et gemmarum foliiferarum lanam arachnoideam necnon ob squamas margine longe fimbriatas in genere insignis. Arbor 12–15 m. alta ideoque affini *Larice occidentali* valde humilior, a qua notis indicatis, foliorum numero, directione et forma, strobilisque satis diversa.

7. DAMMARA *Motleyi*, Parlat.;* foliis parvis (3–4 cent. longis, 15–21 mill. latis), oppositis, breviter petiolatis, vix basi contortis, ovalibus, apice fere acuminatis, marginibus haud revolutis.—In insula Borneo prope Bangarmassing legit Cl. Motley ann. 1857. Arbor excelsa, ab affinibus *Dammaræ* speciebus foliorum parvitate facile distinguenda. Ipse Clarissimus Motley a *Dammara orientali* proximæ Javæ insulæ speciem hanc jam differre notavit, quamvis plantæ Borneensis strobilos videre non potuisset.

* The genus of the last plant must be considered doubtful, as the fruit is unknown. It may be a *Podocarpus*. Some time ago I asked the question in the 'Gardeners' Chronicle,' how the *Nageia* section of *Podocarpus* could be distinguished from the genus *Dammara* in habit; and since then Mr. Charles Moore, of Sydney, has drawn my attention to the fact that the trunk of the Dammaras is leafy, even after the branches are several feet long, whilst in *Podocarpus* it becomes bare at a very early stage; and as far as I have been able to observe this distinction holds good.—*B. S.*

CHINCHONA* CULTIVATION IN INDIA.

COMMUNICATED BY CLEMENTS R. MARKHAM, F.S.A., F.R.G.S.

[The important and interesting experiment which is now progressing in India under the able superintendence of Mr. M'Ivor, of introducing the cultivation of the species of Chinchona plants, the barks of which yield quinine and chinchonine, is well worthy the care and expense which has been devoted to it by the Indian Government, and deserves the especial attention of botanists. All the preliminary proceedings connected with the collection of these precious plants in South America, their transmission to the Neilgherry hills, and the earlier stages of their experimental cultivation, have been fully detailed by Mr. Clements Markham in his work, recently published by Murray, 'Travels in Peru and India.' We are now in a position to supply an account of the subsequent progress of the Chinchona cultivation, from official documents recently received in England; and we shall continue, from time to time, to keep our readers informed of the prospects of this beneficent measure, the importance of which to India, and, indeed, to the whole civilized world, is incalculable.—ED.]

Extracts from the latest Report of Mr. M'Ivor, the Superintendent of Chinchona Plantations on the Neilgherry hills:—

"It is now (July, 1862) a little more than a year since we fairly began the cultivation of quinine-yielding Chinchonas on the Neilgherries; and although our operations are necessarily in the first stages, the information which has been obtained with reference to the nature and requirements of the plants, their propagation and cultivation, and the general success which has attended our efforts, will, I trust, render this Report not uninteresting. The species introduced into India are, —*C. Calisaya*, *C. succirubra*, three varieties of *C. officinalis*, *C. nitida*, *C. micrantha*, *C. Peruviana*, *C. lancifolia*, and a speci s without name; and the present condition of our experiment holds out great promise that the importation into India will be attended with results equal to those effected by the introduction of sugar-cane into the West Indies, in 1506, of rice into America, and cotton into Egypt.

"The great losses which have generally been sustained by placing newly-imported plants at once out in the open air, suggested to us the

* In the 'Botanical Magazine,' *sub tab.* 5364, Dr. J. D. Hooker has drawn attention to the fact that Linnæus spelt this word not only *Cinchona*, but, in the edition of 1767, *Cinhona*. Those who have hitherto objected to the correct spelling (*Chinchona*, because the genus was named after the Count of Chinchon) on the plea that Linnæus wrote *Cinchona*, will see the impropriety of adhering any longer to that orthography.

With regard to the nomenclature of the species, and its varieties, from the forests

desirableness of placing our plants, in the first instance, under the protection of glass. This gave us the power of rapidly increasing the plants, while it offered the great advantage of enabling us to note with much accuracy the various conditions affecting their health and growth; and this was rendered of more importance as the information we originally possessed, with reference to the cultivation of these plants, was so vague and ambiguous, and in many cases, indeed, so conflicting, contradictory, and absurd, that it rendered the attainment of early practical knowledge of great value; while we based our theory of cultivation upon the observations of Mr. Markham, and the other agents employed in introducing the plants into India.

"As early as 17th August, 1860, orders were received to select and prepare sites for the cultivation of the plants. But at that time we felt our information inadequate to enable us to perform this very important task with the degree of certainty required, and it was suggested that, prior to their final adoption, they should be examined and approved by Mr. Markham. That gentleman visited India towards the end of

of Loxa, Mr. Markham has sent out the following Memorandum to India; and the nomenclature therein suggested has been adopted in the following paper.

"There has been much confusion in the nomenclature of the species of Chinchona from the forests of Loxa, three varieties of which are growing on the Neilgherry Hills. They are all classed by Dr. Weddell under the head of *C. Condaminea*, and hitherto the varieties have been called in Mr. M'Ivor's Reports—1, *Uritusinga*; 2, *Chahuarguera*; 3, *crispa*. Dr. Hooker, in a recent number of the 'Botanical Magazine,' has named the species *C. officinalis*, reverting to the original name given by Linnæus (see p. 9 of 'Travels in Peru and India'). Dr. Hooker says:—'When once the law of priority is departed from without perfectly good cause, the door is opened to endless future change and consequent confusion. The genus was founded upon the one plant called Quinquina by La Condamine, to which Linnæus gave the specific name of *C. officinalis*. This name, which appears to us in every way unobjectionable, and which was adopted by Vahl and Lambert, Willdenow, Lamarck, and Roemer and Schultes, was changed by Humboldt and Bonpland to *C. Condaminea*, on grounds which we consider insufficient.' It is, therefore, proposed that the name *C. officinalis* should be adopted for this species now thriving in India, out of deference to the opinion of so high an authority on systematic botany as Dr. Hooker. With regard to the three varieties of this species now growing on the Neilgherry Hills, it is proposed to adopt the following names, with the concurrence of Sir William and Dr. Hooker:—1. That now called *Uritusinga* was the original variety discovered by La Condamine, and it should therefore bear his name, var. *Condaminea*. 2. That now called *Chahuarguera* is the identical plant figured in plate x. of the great work of Humboldt and Bonpland (the unshaded branch with capsules). It ought, therefore, to bear the name of one or other of those eminent naturalists. A species of Chinchona has already been called after Humboldt, and it is therefore proposed to call this variety *Bonplandia*. 3. The variety *crispa* by Tafalla requires no alteration. We have therefore:—*C. officinalis*: 1, var. *Condaminea*; 2, var. *Bonplandiana*; 3, var. *crispa*."—Ed.

1860, and feeling a difficulty in forming a correct opinion, owing to his inexperience of this climate, he requested my aid in the matter. While in the Andes, Mr. Markham noted with great minuteness the various influences affecting the growth of the Chinchonas; these observations were placed in my hands, which, combined with a long personal intercourse, enabled us fairly and impartially to discuss the altered conditions of our climate, and the consequent modifications required to be possessed by the sites we selected, in order to secure success. It was felt at the time that much would have to be developed by practical experience; and so far as our operations have progressed, the correctness of the opinions originally formed by Mr. Markham has been faithfully developed.

"In the system of cultivation pursued here, we have simply endeavoured to administer to the greatest extent possible those favourable conditions, and to mitigate or remove the adverse ones. Although this system has been met with opposition by gentlemen in this country, it is nevertheless one which has secured to us the great success we have obtained in so short a time, because the true principles of cultivation clearly point out, that as we follow nature in all that is beneficial, we should assuredly reject all that is injurious. Under this impression, we have latterly followed the system of open cultivation in every respect; we rear our seeds, strike our cuttings, and place out our plants in the nurseries, using as little shade as possible, and our results have incontestably established its great advantages.

"The first sowing of our imported seeds took place in February, 1861, and no certain data being given, our first operations were necessarily experimental, and consequently a number of the seeds were lost, by being sown in too retentive a soil, and supplied with what (to Chinchona seeds) proved to be an excess of moisture. The greatest success obtained in our first attempts was by the use of a soil composed almost entirely of burnt earth, on which nearly sixty per cent. of our seeds germinated, the temperature of the earth being kept above 70° Fahr. The period required before germination took place varied from sixty-two to sixty-eight days.

"A supply of seeds recently received of the valuable varieties of *Chinchona officinalis*, have made more satisfactory progress; these were sown on the 11th of February, 1862, on a very light, open soil, composed of a beautiful light felspathic sand, with a small admixture of leaf-

mould. Our experience with the first seeds plainly indicating that the Chinchonas are very impatient of an excess of moisture, great care was taken in the preparation of the soil used in this sowing. The leaf-mould was, in the first instance, exposed to the sun for two or three days, and thoroughly dried; it was then heated to about 212° Fahr., in order to destroy all grubs and larvæ of insects; after being allowed to cool, it was brought into the potting-shed and watered sufficiently to make it moist, but only to that degree of moisture that the particles of soil would not adhere to each other when pressed firmly with the hand; that is, the earth, on being laid down, was sufficiently dry to break and fall into its usual form. The leaf-mould and sand in this state of moisture were mixed together and the pots filled, the surface lightly pressed down, and the seeds sown thereon being lightly covered with a sprinkling of sand. The pots were then plunged into beds of moist sand, on a bottom bed of about 72° Fahr.: these were never watered in the strict sense of the word; when the surface became dry, they were merely sprinkled with a fine syringe, just sufficient water being given to damp the surface, but never to penetrate or consolidate the soil; under this treatment the seeds began to germinate very strongly on the sixteenth day after sowing, and still continue to germinate. The principal art appears to be to keep the soil in a uniform state of moisture, but never wet. The least excess of moisture causes the seeds to mould and damp off in thousands; while, as a matter of course, if kept too dry, they become parched up. As soon as the seeds germinate, they are carefully pricked out into fresh earth (prepared as above described);—this operation is a very delicate one: the radical, being carefully raised out of the original seed-pot, is removed to the new pot, being carefully covered with soil, while the seed-lobes are kept well above the surface. In this way twenty-five to fifty seedlings are transplanted into a five-inch pot, and then treated in every respect the same as the seeds; that is, they are never watered, the surface being merely sprinkled, and the pots plunged in beds of damp sand, as above described, to keep the soil in that medium state of moisture in which it was when first placed in the pots. The necessity for this care is to prevent the seedlings from damping off, to which they are much inclined when treated otherwise; it also greatly facilitates their growth, and the formation of roots: the earth in which they are placed being so perfectly open that it is readily affected by the action of the atmosphere,

and thus kept in the most favourable condition for promoting vegetation. When treated in this way, our seedlings have made an average growth in one year of over thirty inches, while many of our seedlings which were raised and grown in a retentive soil, have not attained the height of three inches in the same period.

"As soon as our imported plants and seedlings had attained sufficient size, they were propagated by being layered. In this way they were found to root readily in about six weeks, or two months at the latest, and the plants being bent down, it caused them to break or throw out shoots from every bud along the whole length of the stem; and not only this, but many latent buds were developed, and a fine growth of young wood produced for succeeding layers and cuttings. In this way each plant was treated as it gained sufficient size, namely, from eight to ten inches in height, until we had procured about 3000 layered plants. Beyond this, we have not extended our stock of plants for propagation, as we calculate that 3000 plants will always yield as many cuttings and layers as we can possibly require. The principle of layering we have adopted is something different from that usually practised, as we found the sap of the Chinchonas, when cut, flowed so freely from the wound, that if merely placed into the soil, it was apt to cause mildew and rot. To remedy this, a piece of perfectly dry brick is placed into the cut as soon as made; this absorbs the sap, and effectually prevents the ill effects it produced. The layers when well rooted are removed from the parent plant, potted off, and kept in a close atmosphere for a few days, until they become established. In removing the layers great care must be taken, for if they are cut off before the shoots have attained a good size and developed their leaves, the stock or parent plant is almost certain to die off. The reason of this is, the sap flows into the plant with equal vigour, but cannot be elaborated because of the removal of the leaves attached to the layer, and consequently it ferments and causes rot in the parent plant. So marked and undoubted is the fact, that if our trees are at any time cut down for their bark, not one in ten will survive; hence appears the necessity of the mode of cultivation detailed hereafter.

"Our object being to produce the largest number of plants in the shortest possible space of time, our attention was early turned to growing the Chinchonas by cuttings, and in this respect, also, our first operations were not attended with the success desired. We soon

discovered that cuttings from old wood, or rather from wood three to four months old, were difficult to root, requiring from two to three months, and that it frequently damped off. It soon became plain that the youngest wood that could be procured was the best adapted for making cuttings, as the young tender shoots, from a fortnight to three weeks old, formed roots in a very short time, the majority of these cuttings being rooted invariably within a month; it is however difficult to deal with this description of wood, and to ensure success requires a great amount of care. The earth in which these cuttings are placed is prepared as before described for the seeds; it is, however, kept a little drier. The cuttings, on being made, are placed around the sides of pots, the cut end of each being pressed firmly on a piece of dry brick. Each pot contains from 20 to 30 cuttings, and as they are filled they are immediately removed from the propagating frames and plunged into beds of damp sand, on a bottom-heat of about 80° degrees Fahr. The cuttings are now carefully watched, and their leaves moistened by a fine syringe, when the atmosphere in the cases appears dry; they are, however, never watered, it being very necessary to success to avoid this, as we have invariably found that when the earth is once watered it causes the cuttings to damp off and seriously retards their rooting. The cause of this appears to be that the cuttings not only suffer from excess of damp, but the soil when watered in the usual way after the cuttings are placed in the pots, by its expansion and adhesion from the action of the water, the particles of soil are forced far too close together to be beneficial to the development of roots. With young woods, our loss in it has not averaged three per cent. In removing the cuttings from the stock-plants, one or two pairs of leaves or buds should, if possible, be left between the plant and the part cut. This is done in order not to decrease the succeeding supplies of young wood, which would be the case if the cut was made close to the parent stem. Another circumstance very necessary to be attended to in order to ensure success is to be careful to place each cutting as it is made into a pot, with the cut end on a dry piece of brick. This must be attended to, because when the cut is made the sap begins to flow, and if not immediately absorbed by the brick, causes mildew and rot. When the cuttings are placed in the cases, they are exposed to as much light as they can bear without flagging.

"In December, 1860, it occurred to me that the plants could be suc-

cessfully propagated by leaves with the buds attached; and as this method offered very considerable advantages in producing a large number of plants from a limited supply of wood, we resolved to attempt the experiment, which has been carried out most successfully. The whole secret of success depends entirely on the amount of moisture given: if this is supplied in excess, they rot immediately, even in a day; but if sufficient care is exercised, the losses will not exceed three or four per cent., and this percentage has not been exceeded by many thousands we have propagated in this way: by this method fine plants are obtained in every respect resembling strong, healthy seedlings. The period required to form roots is nearly the same in all the species, varying from three to six weeks. The usual way in which we prepare the buds is to remove the point of the shoots for a cutting; the stem is then divided near the middle of each internode, split down the centre, and immediately placed upon the brick in the pot; the bud itself being covered with about a quarter of an inch of soil, while the leaf of course projects above the surface. The pots are then plunged in damp sand, and treated in every respect the same as cuttings.

"The entire adoption of the system of cultivation under the shade of living trees, has been endeavoured to be forced on Government by the scientific men who have visited, and who conduct the Java plantations. It is, however, a question of very doubtful utility, as it has been in operation in Java for many years without producing the desired results; it moreover seems to have been adopted from a want of confidence in discriminating between the conditions which are beneficial, and those that are injurious, in a state of nature; hence a slavish imitation of what has been described as the natural conditions of the plant in their indigenous localities on the Andes. In cultivation, this implicit imitation of all the natural conditions under which the plants must of necessity grow in a wild state has invariably led to bad results, as it indeed must of necessity do; because the whole art of culture is vested in the very simple art of ministering to the plants such conditions only as are conducive to their perfect development, and of removing and mitigating to the greatest extent possible those that injure. To give a new example. When coffee cultivation was attempted in Ceylon and the Wynaad, numerous enterprising and intelligent men imitated nature in this respect, and planted their coffee under shade; after eight or ten years it was discovered that no return whatever

could be obtained under such circumstances; and after this amount of time lost, money expended, and hopes disappointed, they had to begin and fell the whole of the shade, to the almost utter destruction of their plantations; and although we have been subjected to criticism in recommending a different course, I feel that it must be admitted that, had we accepted argument or opinions against facts daily developed before our eyes, together with the practical experience of generations, we should have given cause for much more serious strictures.

"It was proposed to confine our operations in the first instance to two sites, namely, one suited for the experimental culture of higher-growing species, while the other was selected for such species as require a warmer temperature. With this view the site near Neddiwuttum was fixed upon for our first operations, possessing, as it does, several advantages in reference to exposure, and varying in elevation from 4500 to 6300 feet above the level of the sea. The species to be cultivated here at the lowest elevations is the Red bark of Ecuador and the Yellow or Calisaya bark of Bolivia; and on the highest elevation, the Crown barks of Lima and the Grey barks of Huanuco. The site at Dodabetta is of limited extent, being originally little above sixty acres; however, since the receipt of the *Chinchona crespilla*, we have included in this site about twenty-five acres more, as being likely to suit the habit of this species: and I trust this arrangement will meet the approval of Government. This site possesses a great variety of exposure, and a great variety of soil also, and thus offers great advantages for an experimental plantation. The species intended to be cultivated here were *C. nitida*, or Grey bark, and varieties of *C. officinalis*, namely, the original Loxa bark, the rusty Crown bark, and the fine Crown barks of commerce. Northern exposures have been selected for all the sites: this has been considered desirable, as the sun's declination is southerly during our dry, doubtful season; consequently the northern slopes of the hills are much more moist during the season than the southern slopes, which receive the rays of the sun at nearly a right angle, hence they become parched and dried up; and this we considered would be injurious to the Chinchonas, and consequently avoided selecting southern exposures for our plantations.

"With the concurrence of Government, we have arranged to plant, in the season of 1863, 75 acres of Chinchona plants under various degrees of shade of forest trees; but only a few acres of this will be under

dense shade, as our present experience has shown that under such conditions Chinchona plants cannot flourish. The main cause of this is, that the roots of the forest trees immediately fill up the holes into which the Chinchona plants are placed, thus depriving them of nourishment at the roots, while they are choked above for want of light. The production of alkaloids also cannot take place until the Chinchona plants have overtopped the forest trees, and expanded their heads to the open sunshine to enable them perfectly to elaborate their juices; and as this will require a period of forty to sixty years, and the necessity to destroy the plantation to obtain the produce even after this lapse of time, this system, I fear, cannot be considered as one at all desirable to follow.

"In the early part of last season several plants of different species of Chinchona were planted out under different conditions, in order to test experimentally which would be the safest system of cultivation to pursue. These plants have been carefully watched and treated in every respect alike, and the result has been that the plants placed without the protection of living shade have made the most satisfactory progress.

"The plants placed under living shade were found to be damaged in some degree by the incessant drip; however, on the weather clearing up, they threw out fresh leaves and quickly recovered, but towards the end of the dry season these plants were found to be suffering considerably from the drought. On taking a few of them up, it was found that the holes in which they had been placed had become filled by the fibres of the roots of the forest-trees in the neighbourhood, which had drawn up the whole of the moisture and nourishment from the soil in which they were planted.

"The average growth of the plants under shade, from the end of May to the 14th of May, 1862, has been about 3 inches.

"In putting out the plants which were placed in the open, without any living shade whatever, we saw from the first that we had to combat, with the young plants, the bad effects of excessive evaporation during our dry season under a bright and scorching sun; we also saw the injury likely to be done to the plants by excessive radiation during bright and cloudless nights. To obviate these disadvantages, the plants were sheltered on the approach of the dry weather by a rough enclosure of bamboo branches, with the leaves adhering to them, so as to give the plants sufficient shelter, both from the effects of evaporation and ra-

diation. In addition to the shade of the branches of bamboos, the soil around the roots of the young Chinchona plant was covered with one or two inches in thickness of half-decayed leaves, and the plants thus treated have a very great luxuriance, which has not been exceeded by any of the plants in our propagating houses. To ascertain the cause of this luxuriance, a few plants were examined at the end of the dry season, when the soil about the roots was found perfectly moist, and thousands of young roots of great strength had penetrated the covering of decayed leaves.

"The following table illustrates the growth of six plants placed out in a cleared spot on the highest and coldest part of the Neddiwuttum plantation:—

			Height when planted, 29th Sept. 1861.	Height on 14th May, 1862.
No. 1.	*Chinchona*	*succirubra*	9 inches	2 ft. 5 in.
No. 2.	,,	*succirubra*	4 ,,	2 3
No. 3.	,,	*micrantha*	3½ ,,	1 4
No. 4.	,,	*micrantha*	3 ,,	1 4
No. 5.	,,	*nitida*	3½ ,,	1 7
No. 6.	,,	*nitida*	3 ,,	1 6

"This result cannot but be viewed as most satisfactory; it establishes beyond a doubt *that our Chinchona plants will grow well under open cultivation*, and thus the experiment will no doubt secure to us all the advantages we can desire.

"It is not only upon these six plants which this opinion is founded, but also on observations made upon many hundreds of plants placed out in our nurseries in December last. A portion of our nurseries were left partially shaded by living trees, while other portions were entirely open; at the end of March the plants left shaded by living trees had scarcely made any progress, while those in the open part of the nurseries had grown upwards of a foot; we therefore cut down the whole of the trees which shaded the nursery, with the exception of one, which could not be felled without damage to the young plants.

"From the observations made under the preceding head, I would most respectfully recommend to the Government that in our operations of next season, the principle of open cultivation alone be pursued.

"The advantages of open cultivation are such as cannot fail to carry conviction to the mind of every man who will give the subject a

moment's serious consideration, as it enables us at once to place our plants out under the most favourable conditions to promote their growth. The soil is not impoverished by the roots of neighbouring trees, the plants cannot suffer from drip, nor from the effects of evaporation or radiation, as the dead shade affords them in this respect a far more efficient and certain protection than could possibly be given by any living shade, while, instead of impoverishing, it enriches the ground. It also possesses the incomparable advantage of being entirely under our own control; it can thus be adjusted exactly to suit the seasons. In the wet weather, when shade would be decidedly injurious by promoting the growth of fungi and causing rot, it can be removed; while, in the dry season, it can be increased to any extent necessary. It also enables us at once to place the plants under the most favourable conditions for the development of the alkaloids; and under this system of cultivation, I have no doubt that many of the species will give a supply of bark in from six to seven years after planting, and that in eight to ten years they will give a large yearly supply. This artificial shading will of course be required until the plants attain sufficient size to cover the ground, which will probably be in two years or less.

"In a state of nature all products are reaped in the most improvident and reckless manner possible; but the moment the plants are brought into cultivation this must cease, and the harvesting of the produce of one year must be effected in such a manner as not to injure that of succeeding years. Although in the forests of the Andes the trees are cut down and stripped of their bark, such a system can never be profitably put into operation in cultivation, and another more suited must therefore be devised. I would suggest that our trees be planted in such a manner as to secure a constant and uniform yearly supply of bark by simply lopping and pruning the trees; if this operation be conducted with skill, the plants will be benefited rather than injured by the yearly removal, before the middle of the dry season, of a certain portion of their branches. This will not retard the growth of the plants, nor indeed can any damage arise from an attempt to carry out this system.

"In the first years, probably from the sixth to the eighth after planting, the produce will be comparatively small, and be entirely of the description known in the market as quill bark; but after the twelfth year of the growth of the plants, a large proportion of the loppings and prunings will produce what is known in the market as flat or trunk

bark. As an argument against this system, it has been advanced that Chinchona plants do not throw out any branches ; but this is a mistake, as we have some plants, although little more than fifteen months old, with eleven to thirteen branches, and some of these branches themselves measure 3½ feet in length, and the secondary branches 1 foot 4 inches. There is certainly nothing in the habits of all the species of this plant but what promises to be admirably suited to this method of cultivation ; and from our own observations, I feel convinced that much, if not the whole, success of the cultivation depends upon our results in this part of the operation.

"In order to obtain the greatest produce from our plantations at an early date, it appears to be desirable to place our plants rather close together, and with this object in view in our operations of this season, we have prepared to place the shrubby varieties at a distance of 7 or 8 feet apart, which will give about 889 to 680 plants respectively to the acre. The layer-grown species at 9 and 10 feet apart, will give about 537 and 435 plants to the acre; this of course would be much too close to remain to retain their full size, but when they begin to crowd and impede the growth of each other, they can be thinned out, and this operation will no doubt furnish a large supply of bark, as they will probably not require to be thinned out before the twelfth year of their growth, as when they first begin to crowd sufficient light and air will be afforded by lopping and pruning a portion of the branches.

"So far as our operations have progressed, the experiment has been eminently successful both as regards the number, genuineness, and value of the species introduced, their increase and cultivation. The very important fact has also been established that the climate of the Neilgherries is suitable for the growth of all the most valuable species of Chinchona, and that the plants possess as great power of withstanding extremes of wet and drought as is generally the case with evergreens. It has also been ascertained that the Chinchonas, like nearly every other plant, have a distinct period of growth, which extends over about nine months of the year, the remaining three months being one of comparative rest ; this has especially been clearly demonstrated by our seedlings in glass-houses, for although the temperature and moisture were kept nearly uniform through the year, yet towards the season of rest, the growth of the plants became less rapid, the upper leaves

assuming a leathery texture, while the lower leaves became red and fell off, thus exhibiting the usual signs of a definite season of rest.

(Signed) "WM. G. M'IVOR.

"*July*, 1862."

On January 1, 1863, the number of Chinchona plants permanently planted out on the Neilgherry hills, was 35,000, all of which were making satisfactory progress. The largest plant was 7 feet high, with branches from 3 to 5 feet in length, and the stem, at half a foot above the ground, 5¾ inches. The total number of Chinchona plants on the Neilgherry hills, at the same date, was as follows:—

C. succirubra	45,352
C. Calisaya	1,448
C. officinalis (var. *Condaminea*)	872
" (var. *Bonplandiana*)	46,751
" (var. *crispa*)	664
C. lancifolia	1
C. nitida	8,591
C. micrantha	8,304
C. Peruviana	2,729
Species without name	2,569
C. Pahudiana	425
Total	117,706

In September, 1862, Sir William Denison, the Governor of Madras, visited the Chinchona plantations, and recorded a minute, of which the following is an extract:—

"I visited Neddiwuttum a few days ago, and found the state of the plantation to be as follows. At the top of the hill, a height of about 6000 feet above the sea, a number of plants had been in the ground for upwards of a year. They had been exposed to the cold of the winter, the drought of the spring, the wet of the monsoon, yet nothing could look more healthy and flourishing than the whole of them. Further down the hill, a piece of ground about 68 acres in extent had been cleared and prepared for plants; this site occupied two sides of a valley, and was sheltered by belts of trees or the ridges separating it from the adjacent valleys. About 18 acres of this were planted, and the plants looked healthy and flourishing. In an adjacent valley, at a lower level, about 180 acres had been felled and partially burnt, and below this again was the propagating-house and the nursery for

young plants. I should be disposed to recommend that the experiment should be pushed on steadily and regularly, and that 150 acres should be added annually to the plantations, for a period of nine or ten years at least. Should the lopping and pruning produce the quantity of bark anticipated by Mr. M'Ivor, the return will be sufficient to repay the capital expended in about ten years, inclusive of interest. The cost to the Government would be at the utmost, supposing here to be no return in the interval, about £100 per acre, and the return even at present prices would be at least £16,000 per acre. "The number of trees which an acre will cover is about 650, and it is calculated that each tree will produce after ten years' growth, 5 bs. weight of bark annually; the yield per acre will thus be 3250 bs., and for 160 acres 480,000 lbs., or upwards of 200 tons, at sixpence per pound, which I believe to be a low price. This will give £12,000 per annum as the return upon the 160 acres, the annual expense of management being £1320."

On October 22nd, the Madras Government recorded the following order:—

"The Government resolve to bring the papers relating to the experiments now being made upon the Neilgherries in the cultivation of the different species of Chinchona, to the notice of the Secretary of State. The Dodabetta plantation extended at present over 60 acres, of which 15 have been already occupied, while the remaining 45 are in various stages of preparation, and will be planted before the end of the current year. The Neddiwuttum site comprises 150 acres, of which 21 have been planted, and the remainder more or less prepared. The actual plantation will be extended from 21 to 100 acres in the course of the present calendar year. The rapid propagation of the plants has enabled us to offer a considerable number for sale early next year, at the moderate price of 4 annas or sixpence each."

The following important discovery respecting the febrifugal virtues of the *leaves* of Chinchona plants has been reported by Dr. Anderson, who is in charge of the Chinchona experiment at Darjeeling:—

(*From the Supplement to the 'Calcutta Gazette,' October 15th (No.* 54), 1862.)

From T. ANDERSON, Esq., M.D., Officiating Superintendent, Botanic Gardens, Calcutta, to H. BELL, Esq., Under-Secretary to the Government of Bengal.

"I have the honour to report to you, for the information of the

Lieutenant-Governor, that I have succeeded in forming an infusion of the leaves of *C. succirubra* from the plants of that species in the Chinchona Nursery, near Darjeeling. The leaves fell off spontaneously during the months of June and July. I sent the infusion to Dr. Collins, Civil Surgeon of Darjeeling, with a request that he would administer the infusion to some of the patients in the Civil Hospital. He has just informed me that he had given the infusion in doses of one fluid ounce to the first four cases of intermittent fever that occurred, and that these patients had been cured without any other medicine whatever. This result proves that the infusion of the leaves of *C. succirubra* possesses some of the febrifuge properties of Chinchona; the infusion is of a dark chocolate colour and is intensely bitter. I hope to be able to submit an account of the chemical analysis of this infusion by Dr. Macnamara, Chemical Examiner to Government."

In January, 1863, the Secretary of State for India, in Council, addressed a dispatch to the Madras Government on the subject of Chinchona cultivation, of which the following are extracts:—

"The complete success which has hitherto attended this important experiment is very satisfactory, and I am of opinion that it has now reached a stage at which it has become necessary to take effective steps both to ensure the steady annual increase of the area of the Government plantations in the Neilgherries, and the introduction of the Chinchona into other hill districts. I therefore approve of your resolution to plant 150 acres annually, for at least ten years, so that, at the end of that period, there may be a prospect of obtaining a very large harvest of quinine-yielding bark. No return can be expected before that time, so far as bark is concerned; but I take this opportunity of calling your attention to the Supplement to the 'Calcutta Gazette' of October 15th (No. 54), 1862, in which it is stated that an infusion of the leaves of *C. succirubra*, which had spontaneously fallen from plants in the Darjeeling nursery in June and July, had been administered to patients suffering from intermittent fever, who were cured without any other medicine whatever. If the Chinchona leaves can thus be turned to account, a return on the outlay may be obtained almost immediately, while great additional benefit will be derived from the cultivation of the plants. The medicinal properties of the leaves can be tested on a very much larger scale in your Presidency than at Darjeeling, and I desire that measures may be taken for

obtaining an analysis of the leaves, and that a supply may be sent to some one of the Government hospitals for trial.

"Chinchona cultivation should be introduced into the other hill districts of your Presidency, as well as into Coorg. The two great objects of the experiment are the provision of an abundant and certain supply of bark for the use of hospitals and troops; and the spread of the cultivation throughout the hill districts, in order to bring the remedy within the reach of frequenters of jungles, and of the native population generally. Your Government has very justly observed that 'the experiments cannot be regarded as a mere money speculation,' nor are the commercial advantages that may be derived from it to be considered as other than a secondary consideration; though of course a return for the outlay, and the spread of Chinchona cultivation by private enterprise, are very desirable in themselves.

"The Collectors of Coimbatore and Madura, in concert with Mr. M'Ivor, should be directed to take the earliest opportunities that offer, of introducing Chinchona cultivation into the hill districts of their Collectorates; and a request to the same effect should be sent to the Commissioner of Mysore, with respect to Coorg, where there are many coffee planters who would doubtless be willing to undertake this cultivation.

"Your resolution to offer a certain number of plants for sale every year at a moderate price, will have the important effect of extending the cultivation over a wider area. Two companies have already been formed in London, for the object of cultivating Chinchona, in combination with coffee and tea, in the Western Neilgherries and Wynaad; and I observe that Mr. Lascelles, the agent of one of these companies, has already bespoken 10,000 out of the 20,000 plants which are to be sold this year. Chinchona, when grown together with coffee, is likely to be a profitable investment, especially if the leaves can be turned to account, notwithstanding the greater length of time that must elapse before any profit can be expected from the former. I am, therefore, inclined to take a more hopeful view of the prospect of capital being invested in this speculation than your Government has been able to do; and I desire that every legitimate encouragement may be extended to individuals or companies who may undertake Chinchona cultivation."

In Ceylon the cultivation of Chinchonas is making satisfactory pro-

gress, under the able superintendence of Mr. Thwaites. The following is an extract from that gentleman's Report, dated August, 1862:—

"The experiment in the cultivation of some of the Quinine-producing Chinchonas is proceeding most favourably, and the progress made may be considered extremely satisfactory, taking into consideration the limited supply of seeds we received to commence with. Mr. M'Nicoll has been very successful in the management of the plants under his care at Hakgalle. Several of the larger ones have been planted in the forest, and are flourishing vigorously, and preparations are now being made for many more being put out. Open spaces of a moderate area are being cleared in the forest, in order that the plants may have plenty of light, and yet be sufficiently protected by the surrounding trees from too much wind, which the Chinchona plants are not able to bear without injury, owing to the large size and not very firm texture of their leaves. Much care is required in these arrangements; for the Chinchona plants become drawn up and weak when in dense shade; whilst, if exposed to plenty of light, with direct sunlight upon them for a few hours during the day, they assume a most healthy and robust appearance, with stems of a deep red colour, and leaves of a much firmer texture. A certain number of the plants, placed in very favourable situations for shelter from the wind, are being allowed to grow up to their full height, with the view of their producing flowers and seed; but as it will probably be only after the expiration of some few years that this will occur, and as it is desirable, in order to be prepared for an early distribution, to increase the number of our plants as rapidly as possible, Mr. M'Nicoll is effecting the latter object by striking cuttings from a considerable number of plants which he has reserved for the purpose. Large cuttings of *C. succirubra* would appear to strike readily in the open ground; but of large cuttings we can of course get only a few at present, owing to our plants being all young. Smaller cuttings are struck in a hotbed, and roots are produced upon them in a fortnight or three weeks. After as many cuttings have been taken from the reserved plants as these will at one time yield, some interval must necessarily elapse before other shoots are produced of suitable size for removal for the next lot of cuttings. Mr. M'Nicoll will have, before many days, nearly 600 plants of *C. succirubra* struck from cuttings, and he anticipates that this number will be very considerably added to in a few weeks. Many of these plants will probably be suf-

ficiently established in growth to bear removal in three or four months, should it be deemed desirable by Government to commence their distribution so soon,—on a small scale, of course, at first. It may be thought advisable to allow applicants to have, at a price to be determined upon, a few, say four or five plants, to enable them to ascertain the suitableness or otherwise of localities they may have selected for the cultivation of this valuable plant. Some plants of *C. succirubra* received from the establishment at Kew during the past year, and which arrived in not very strong condition, I have deemed it desirable to keep at Peradenia, for propagation from by cuttings. Of 150 which were dispatched from Kew, 110 survived, and are now growing well here. From these, and from a few plants we raised from seed, Mr. Cameron has, by means of a hotbed he has constructed here, succeeded in striking a good many cuttings, which will be useful by-and-by for distribution in districts contiguous to this.

"Although the climate of Peradenia is not so favourable for *C. succirubra* as is that of Hakgalle, some plants of it growing in the open ground here are nevertheless doing very well; and we find, that even at this low elevation they thrive best when well exposed to the light, with the sun upon them for an hour or two during the day. Exposure to the sun for the whole of the day is more than they can bear without injury.

"Of *Chinchona officinalis*, a small supply of most excellent seeds was received a few months ago from Mr. Clements R. Markham. From these a number of young plants have been raised by Mr. M'Nicoll, and are in a thriving condition at Hakgalle. The climate of Peradenia is much too hot for this valuable species.

"*C. Calisaya* has not succeeded so well with us as have the other kinds we have under cultivation, owing, I believe, to the plants, which were all received from Kew, having been injuriously affected by the long voyage from England. I am expecting a number of plants of this desirable kind from Java; Mr. Van Spall, of the Civil Service of that island, who visited Ceylon a short time ago, having kindly interested himself in the matter, and obtained the sanction of the Javan Government for the transmission of some plants of *C. Calisaya* to this establishment.

"The following is a list of the Chinchona plants under cultivation at Hakgalle:—

"*C. succirubra*, planted out in the forest		194
	The largest plant being just 4 feet high, with stem $1\frac{1}{4}$ inches in diameter, and leaves 18 inches long by 12 inches wide.	
Do.	In pots, to be planted out as soon as spaces have been cleared in the forest for their reception	338
Do.	In pots, struck from cuttings	395
Do.	Cuttings not quite rooted	200
C. officinalis, var. *Bonplandiana*, in pots		960
C. officinalis, var. *crispa*, in pots		24
C. Calisaya, in pots		2
C. Pahudiana, in pots		4

"The following plants, raised from seeds sent to me under the several names appended to them, are at present quite undistinguishable by their foliage :—

C. micrantha, planted out in the forest		43
Do.	In pots	130
C. Peruviana, planted out in the forest		18
Do.	In pots	6
C. nitida, planted out in the forest		15
Do.	In pots	40
Species without name, planted out in the forest		34
Do.	In pots	31

"The following is a list of Chinchona plants at Peradenia :—

C. succirubra, planted out in the grounds		36
Do.	In pots	157
Do.	Cuttings not yet quite rooted	118."

HYPNUM EXANNULATUM, *Br. and Sch.*, A NEW BRITISH MOSS.

According to its authors, this is a rare European Moss, very seldom found in fruit. It had not been noticed in Britain till discovered recently by Mr. Skipper at Tuddenham, in Suffolk. It is likely to occur in other localities, and may have been overlooked from its striking resemblance to *H. fluitans*, L. By the kindness of Dr. W. M. White, of Lavenham, I have obtained specimens. Only barren plants have yet

been observed. Its place in the genus is between *H. fluitans*, L., and *H. uncinatum*, Hedw. It has the habit and consistence of the former species, but differs from it in having dioicous inflorescence, in the more compact cellular tissue of the leaves, and in the longer and more slender capsule. With the habit of *H. fluitans* it has, however, more of the structure of *H. uncinatum;* but it may be distinguished from this species by its dioicous flowers, its less curved and non-plicate leaves, which have a more compact cellular structure, the much shorter apex of the perichætial leaves, and by the absence of the capsular ring, the character which suggested its specific name.

The gentlemen named were fortunate to collect in the same locality large quantities of *Cinclidium Stygium*, Swartz, in fruit, a very rare British Moss, but which must, like the former, be frequently overlooked from its resemblance to the common *Mnium punctatum*, Hedw.

W. Carruthers.

CORK-TREE AT SUMMERTOWN, NEAR CORK, IRELAND.

In Loudon's 'Magazine of Natural History' (ii. 91) there is an account, with a drawing, of a Cork-tree of large size then (1828) growing near the city of Cork. Its girth at 3 feet from the ground was then 8 feet 10 inches, the "horizontal diameter or spread of the head, measuring from the extremities of the branches," was 36 feet. The same wood-block is reproduced in Loudon's 'Arboretum.' My friend Mr. Isaac Carroll informs me that the tree is still flourishing, and only suffered from the cold winter of 1860–61 to the extent of having much of its foliage killed.

But the interest attaching to this tree is of a higher order than might at first sight be supposed. In the 'Bulletin de la Société Botanique de France' (iv. 449) M. J. Gay points out that the *Quercus Suber* of the coasts of the Atlantic in France and Spain is not the tree so called on the shores of the Mediterranean Sea. He names it *Q. occidentalis*, and states that its acorns require fourteen or fifteen months for their maturation, whilst those of the true *Q. Suber* become ripe in four or five; the scales of its cupule are not all adpressed as in *Q. Suber*, but the lower are reflexed; besides other characters. He states that it is not

nearly so tender as the true Cork-tree, which cannot withstand the winter at Paris.

Such being the case, it became a point of interest to him to learn to what species the Cork-tree of Summertown belongs. He wished to visit the tree himself; but gave up the idea on account of the great addition it would have made to his tour in Britain last autumn.

Having learned exactly what M. Gay desired, I applied to Mr. I. Carroll for specimens of the tree. He kindly obtained them, and I forwarded them to M. Gay. The result is most satisfactory. The Summertown tree is *Quercus occidentalis*, Gay. We have now to learn if there are any other old Cork-trees in England or Ireland, and, if such exist, to ascertain their species. The probabilities are very much against any old tree of the true *Q. Suber* being found.—C. C. BABINGTON.

STURMIA LOESELII, *Reichenb.*

In my 'Flora of Cambridgeshire' I remarked (p. 231) that this plant was found in Burwell Fen in 1836 for the last time. It is now my pleasant duty to state that Messrs. H. E. Fox and W. F. Eaton, students of Trinity College, discovered plenty of it in Wicken Fen in the past season (1862). Wicken Fen is now the only place in the Fen country which remains in nearly its original undrained state, and it is therefore to be feared that the plant will not be found elsewhere in the great Fen district. It is worthy of remark, that this Fen is the only known station in the county of Cambridge where the *Senecio paludosus*, Linn., is still remaining. We have plants of it growing in the Cambridge Botanic Garden, which were brought from thence within the last three or four years.—C. C. BABINGTON.

THE UNUSUALLY MILD WINTER.

The continued rains of the past two months, together with the unusual mildness of the season, have produced a remarkable effect on vegetation here. Trees are especially forward. At this date, the end of January, many Sallows (*Salix cinerea* and *S. capræa*) are fairly in

bloom, and the silvery buds are very generally developed. At Bembridge, several Alder-trees are in full flower to-day, the 31st of January. On the Elms and Poplars (*P. alba*) the flower-buds are becoming conspicuous. The Horse-chestnuts are already showing their sticky buds as large as hazel-nuts. The Wall Pellitory (*Parietaria*) seems to have continued to grow throughout the winter, as several young shoots bearing flower were gathered at Quarr Abbey on the 25th of January. The Wake-robin (*Arum maculatum*) is much more forward than usual, most plants showing three or four leaves and making our hedgebanks look quite green. The Honeysuckle and Elder are vigorously sprouting; and in the gardens Rose-bushes have made strong shoots. In one sheltered locality an old "Banksia" Rose-tree trained against a wall already shows its flower-buds. The Spurge Laurel (*Daphne Laureola*) flowered in January. Herbaceous plants are less forward. The Daffodils, which I once have seen flowering in January, are only a few inches aboveground. *Draba verna* is not yet in flower, though in advanced bud.

The following dates will serve to show still more clearly the progress of the season :—

Calendar for January, 1863.

Jan. 5. *Tussilago Farfara* (Coltsfoot) in advanced bud. Flower-buds of *Salix cinerea* much swollen.

„ 6. *Helleborus fœtidus* in flower.

„ 7. Catkins of the Alder nearly shedding pollen. Hazel nearly in flower. Primroses many in flower.

„ 15. Snowdrop and Violets in flower.

„ 20. Butchers' Broom (*Ruscus aculeatus*) in flower. Furze (*Ulex Europæus*) plentifully in flower.

„ 25. *Mercurialis perennis* (Wood Mercury) in flower. *Daphne Laureola* (Spurge Laurel), many bushes in flower. *Corylus* (Hazel) plentifully in flower. *Salix cinerea* et *S. capræa* many plants showing anthers. *Parietaria* (Wall Pellitory) in flower.

„ 26. *Vinca major* plentifully in flower. *Tussilago Farfara* (Coltsfoot) in flower.

„ 31. *Alnus glutinosa* (Alder) in flower. Birch (*Betula alba*) shows young catkins. *Pulmonaria angustifolia*, nearly in flower.

A. G. More.

Bembridge, January 31st.

NEW PUBLICATIONS.

The Flora of Essex. By George Stacey Gibson, F.L.S. London: Pamplin. 1862. (pp. 469.)

Taking Professor Babington's recent Flora of Cambridgeshire as his acknowledged model, Mr. Gibson has drawn up a full and satisfactory catalogue of the plants of his own county. Though there exists no older 'Flora of Essex,' the county is not without its historical associations. The father of English botany, John Ray, was born and educated in Essex, and returned to spend his old age in his native village of Black Notley. Ray's friend Samuel Dale and Richard Warner are among the botanical worthies who in old time herborized on the same ground. Above all, the lamented Edward Forster gave much time to exploring the botany of his native county; and, as we learn from Mr. Gibson, he had taken some steps in the preparation of a Flora. To all these honoured names our author has done full justice, both in his biographical appendix and by citing their observations whenever of sufficient interest.

The wild plants already found in Essex amount to no less than 1070 species; a proof at once of the botanical richness of the county, and of the time bestowed on examining the ground, as well as of the care taken to incorporate all that could be gleaned from ancient and modern authorities. Four of our British plants are peculiar to Essex,—*Lathyrus hirsutus*, *Galium Vaillantii*, *Bupleurum falcatum*, and *Lathyrus tuberosus*,—the last recently found growing among corn-crops near Fyfield. Of these, only the first, in our opinion, can be accepted as truly native, and we are disposed to think that there are a few other cases where the mark of suspected naturalization had been well deserved. We would instance *Fumaria parviflora* and *F. Vaillantii*, *Filago Gallica*, *Melilotus arvensis*, *Valerianella carinata*, all "colonists" or roadside weeds. *Asparagus officinalis* also can hardly be held native in the stations given. The position of *Galium Parisiense*, *Senecio viscosus*, and of some of the *Salices*, is open to similar suspicion. It is true that the advantage of challenging the agrestal weeds as interlopers is open to question, and the length to which excessive suspicion may go is well shown by Kirschleger's 'Flore d'Alsace,' in which book *Stellaria media*, *Cardamine hirsuta*, *Galium Aparine*, *Veronica hederifolia*, and even *Polygonum aviculare* are considered naturalized.

Every one who has interested himself in local botany must be well aware of the difficulty not only of reconciling conflicting statements, but of obtaining from each individual observer an impartial report of the nature of the locality in which a plant has been gathered. Yet, if any progress is to be made in distinguishing between native and naturalized plants, too much stress can hardly be laid upon the "kind of station." It is of the utmost importance to know how far the habitat is removed from houses and cultivation, present or past; in fact from every influence, possible or probable, of man. Plantations and shrubberies have far too often been given as natural localities: and, difficult as it may be to form an estimate in a highly cultivated country, it is not less the duty of every field botanist to apply himself to renewed exertions in this respect. It is to the credit of Mr. Gibson that he has given much attention to describing correctly the kind of place in which each species occurs.

We are surprised to find *Vaccinium Vitis-Idæa* admitted as having formerly grown in Epping Forest, for which the recollection of a nurseryman seems hardly sufficient evidence.

A few northern plants occur in Essex, and these may be worth mention, as some of them appear to reach their southern limit in this country. The most remarkable are *Symphytum tuberosum*, *Parnassia palustris*, *Galeopsis versicolor*, *Potamogeton prælongus*, *Elymus arenarius*, and *Salix ambigua*.

Mr. Gibson has been especially fortunate in finding a coadjutor in the person of the Rev. W. W. Newbould, whose assistance is handsomely acknowledged, and to whom are due many of the critical remarks which occur in various parts of the volume.

A map, a table of distribution through eight districts, four plates representing the species peculiar to Essex, together with much interesting matter given in the six articles of the appendix, all show how much pains have been bestowed by the author. The comparison drawn between the Essex flora and those of the four adjacent counties is especially valuable, and some interesting results are also obtained by using the 'Cybele Britannica' as a standard for estimating the predominance of scarce and frequent species. Had space allowed, we should gladly have seen these comparisons carried out more fully, in the form of lists of the plants belonging to the several "types" and groups.

Mr. Gibson's 'Flora of Essex' will rank with those of Hertfordshire

and Cambridge, and must be regarded the most valuable contribution of last year to local botany. A. G. M.

The Transactions of the Linnean Society of London. Vol. XXIV. Part I.

The whole of this Part is devoted to a description of one of the most remarkable plants discovered during the present century, and called by Dr. Hooker, in honour of its discoverer, *Welwitschia mirabilis*. The plant is a native of the stony deserts of South-Western Africa, abounding about Cape Negro and near Waalvisch Bay. It is woody, with an obconic trunk about two feet long, which rises a few inches only above the soil, and presents the appearance of a flat, two-lobed, and depressed mass, sometimes fourteen feet in circumference, and looking like a round table. *Welwitschia* attains a century in duration, and during the whole of this time it has only two leaves, which spring from two deep grooves of the trunk, and, when fully grown, are about six feet long. The discoverer conjectured that these extremely tough leaves, generally split up in numerous longitudinal fragments by the action of the wind and weather, are the original cotyledons, and therefore often a hundred years old. As yet this conjecture has not received confirmation from actual observation, but it has all negative evidence in its favour. To complete the singularity of this production, it has cones!—and is, in fact, a genuine *Conifera*, closely allied to *Gnetum* and *Ephedra*.

As soon as specimens reached Kew, Dr. Hooker, with his accustomed acumen and energy, devoted himself to the examination of them, and the result has been the complete monograph now before us. It has been the botanical event of the year, regarded by phytologists in the same light and of the same importance as the restoration of *Archæopteryx* by zoologists. Indeed, we do not overstate the case when we assert that no more important botanical paper has appeared in the Linnean Transactions since Robert Brown's on *Rafflesia Arnoldi*.

Welwitschia appears to be the only perennial flowering-plant which at no period has other vegetative organs than those proper to the embryo itself,—the main axis being represented by the radicle, which becomes a gigantic caudicle, and developes a root from its base and inflorescence from its plumulary end, and the leaves being the two coty-

ledons in a highly specialized condition. The venation of the leaf is parallel, as in Monocotyledons, yet like many *Cycadeæ* and some *Coniferæ*, there are no lateral vascular communications between the veins. The general plan of the plant, however, is that of a Dicotyledon, as the structure of its embryo indicates. The male flowers are structurally hermaphrodite, and contain a naked ovule in the axis of the flower, which, though without an embryo-sac, has a stigma-like disk at its apex. *Welwitschia* thus presents the hitherto unique case of a structurally hermaphrodite-flowered gymnospermous plant. From the want of the embryo-sac, the ovules in the hermaphrodite flowers are abortive, and after flowering the whole of the female portion turns brown and withers. The fertile ovules occur in larger cones, and have not been noticed on the same plant with the male, so that the cones are functionally unisexual, and the plant is probably truly diœcious, fertilization being effected by insects.

BOTANICAL NEWS.

The 'Gardeners' Chronicle' states that Dr. Lindley has resigned his office of Secretary of the Horticultural Society, "from inability longer to fulfil the duties of the office he has occupied for more than forty years." Mr. W. W. Saunders is to be proposed, at the next Anniversary Meeting, for this vacancy.

M. Alphonse De Candolle, in a letter to us, dated January 29, says: "I am now correcting the proof-sheets of the first fascicule of volume fifteen of the 'Prodromus,' which will contain the *Laurineæ* by Meissner, the *Aristolochiæ* by Duchartre, the *Begoniaceæ* by myself, and several small Natural Orders allied to *Euphorbiaceæ*."

Accounts from the Cape of Good Hope mention the death of Dr. L. Pappe, Colonial Botanist, and author of 'Silva Capensis,' 'Floræ Capensis Medicæ Prodromus' (two editions), and, in conjunction with the Honourable Rawson W. Rawson, of the 'Synopsis Filicum Africæ Australis,' three octavo pamphlets published at Cape Town between the years 1850–58.

Mr. Charles Moore, the Director of the Botanic Gardens at Sydney, is about to publish a 'Synopsis of the Ferns indigenous to New South Wales and the adjacent Countries.'

On the 2nd of December, Professor Parlatore delivered, in the Botanical School of the Museum of Natural History, at Florence, "Parole in Morte di Matteo Blytt," in which the merits of that botanist were dwelt upon with great elo uence.

Botanists are familiar with the results of Dr. Parry's reconnaissance of

the mountains of Colorado Territory, at and beyond the mining district, in the summer of 1861. The limited collections he then made being much in demand, and his desire for exploration still unsated, Dr. Parry revisited this interesting region early last summer (1862), accompanied by Messrs. E. Hall and J. P. Harbour, the party ascending Pike's Peak, and also crossing the principal range into Middle Park, etc. Dr. Parry remained in the mountain region until autumn, for the purpose of collecting the seeds of *Coniferæ*. Having devoted much of his time to geographical and barometrical observations, the larger part of the botanical collections, except towards the close of the season, are due to the sedulous labours of his associates, Messrs. Hall and Harbour. Most of the species collected in 1861, often too scantily for general distribution, have now been gathered anew, and many additional ones have been secured, some of them of great rarity or novelty. Messrs. Hall and Harbour likewise collected the more interesting plants of the plains of Nebraska. A systematic enumeration of the plants collected, with characters of new species, etc., now in preparation by Professor Asa Gray, will immediately be published. The principal collections of the joint expedition, distributed into sets under Messrs. Hall and Harbour's tickets, extend to 695 numbers. These sets will be extended by the addition of from 50 to 100 or more alpine plants from the special collection of Dr. Parry, distributed under and in continuation of his former numbers; so that, in the whole, the flora of the Rocky Mountains will be adequately represented. The specimens are very good and well made; and the collection as a whole is particularly interesting. Thirty sets are offered to botanists. About fifteen of them are nearly complete and full, and are offered at eight dollars the hundred numbers. The remainder fall off to 600 or 500 numbers, and the specimens often less copious; these are held at six dollars the hundred, at which rate they are most desirable acquisitions, and they will doubtless be appropriated as soon as they are known. Applications may be addressed to Mr. Elihu Hall, Athens, Illinois; or especially to Professor A. Gray, Cambridge, Massachusetts, U.S.

Extract from a letter received from Mr. A. Reith, Gardener to M. Do Canto, St. Anna, Ponta Delgada, Azores:—"In the garden at this place belonging to M. Do Canto, there is a good collection of plants of all kinds, excepting Heaths and Epacrises, which cannot stand the heat; and, besides that, the soil is not suitable for them, being merely decomposed volcanic rock. In fact, the whole island is nothing more than an immense volcanic rock; but the majority of plants succeed very well in it. The Araucarias are grand, some of them being from forty to fifty feet in height, and having their lower branches resting on the ground. All kinds of New Holland plants do well, particularly the Acacias and Eucalyptuses, many of which are equal to forest-trees. Among tropical plants, the Plumierias are very beautiful, and flower finely; as also do the Palms. There are some fine specimens of the Date Palm here, with stems upwards of twenty feet high, strong enough to stand against the furious gales of wind so common in these islands. These gales do a great deal of mischief in the gardens, tearing the leaves of large-leaved plants, and blowing others down. It is grievous to see the havoc they make among the Musas;

but, for all that, these plants fruit well, and so also do many other tropical fruit-trees. English fruit-trees are of no use here, the heat causing their fruit to rot before it is ripe. The plant that astonishes me most is the *Drimys Winterii*. There are several fine specimens of it from six to ten feet high, and just now (January) they are in full flower. The seeds appear to ripen well, but as yet I have not been able to raise any young plants from them. This is no country for Ferns, it is too hot and dry; or at least I have not been able to find any but the most common species. The Orange groves are very fine; they have to be sheltered from the wind by means of high stone walls, and the *Pittosporum undulatum*, which has become quite naturalized here, the whole island being overrun with it, and, in the mountains, with the Mediterranean Heath. The mountains are grand, rising up one above another, until their peaks are lost in the clouds. At the top of the highest there is a large lake, and near to it a boiling hot spring issues out of the rock, making a constant noise and vibrating the ground all round it, while close to it there is a cold one,—so close, indeed, that a person might put his little finger in one and his thumb in the other."

Several members of the Linnean Society have requested J. J. Bennett, Esq., their late Secretary, to sit for his portrait, to be placed in their meeting room, in testimony of the appreciation of his unwearied zeal, judgment, and courtesy in the discharge of his duties for the long series of twenty years.

W. H. De Vriese died on the 23rd January, 1862, in the 55th year of his age. He was successively Botanical Professor at Rotterdam, Amsterdam, and Leyden. He contributed numerous papers on economic and medical botany to various journals, with a few systematic papers, the most important of which is his monograph on Goodeniaceæ and Lobeliaceæ. His library and herbaria are to be sold by Van den Hoek, at Leyden, on the 11th to the 13th March. There will be sold at the same time the library of Dr. R. B. Van den Bosch, who died on the 18th January, 1862, at Goes, in Zealand, in the 51st year of his age. He published several papers on Phanerogamia; but he was more especially a Cryptogamist. He assisted Montagne and Lacoste in describing the Cryptogamic plants of Java; but his chief works were his memoirs on Hymenophyllaceæ, on which tribe of Ferns his authority was the highest.

It is just a year since Professor Blume died (February 3rd, 1862). He was born at Brunswick, in 1796, educated for the medical profession; in 1817 he went to Java, where his inquiries into the native medicines led him to study botany. He collected largely, and began to publish while yet too little acquainted with what had been done at home. In 1826 he returned to Europe, where, besides numerous memoirs and smaller works, he published his great works, 'Flora Javæ' and 'Rumphia.' The errors of his early works are unknown in these; they are lasting monuments of his high position as a descriptive botanist, and of his great labour in elucidating the flora of the Malayan Archipelago. His library will be sold by T. O. Weigel, at Leipzig, on 16th March and following days. It contains an extensive collection of natural history works, especially of those bearing on his favourite science. We understand that Williams and Norgate are the agents, in this country, for the two auctioneers.

Erratum.—Page 1, line 8 from below, *read* "British Ferns" *for* "British Flora."

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RARE OR NEW BRITISH HYMENOMYCETAL FUNGI.

By M. C. Cooke, Esq.

(Plate III.)

Agaricus (Pholiota) *leochromus*, n. s.; pileo carnoso, convexo-plano, demum depresso, molli, glabro, non fulgido; stipite solido, subæquali, lævi; annulo persistente; lamellis rotundato-adnatis, subventricosis, e pallido cinnamomeis. (Plate III. fig. 3.)

Pileus 2-3 inches, at first convex, then plane, and ultimately depressed, soft, smooth, but not shining, bright tawny, paler (whitish) at the margin, generally rivulose from the cracking of the cuticle. Stem 3–4 inches, slender, solid, fibrous, internally umber-brown at the base, externally paler, white above, nearly equal, smooth, shining. Ring persistent. Gills rounded behind, adnate, slightly ventricose, at first pallid, afterwards cinnamon. Spores profuse.—On stumps, elder, etc. Cæspitose. Esculent, not uncommon.

Allied to *A. pudicus* and the next species, but differing in habit, as well as in many points of structure, from both. At first I regarded it as a variety of *A. pudicus*, but since receiving from the Rev. M. J. Berkeley what he believes to be the true *A. pudicus* of Fries, I am no longer disposed to regard this as the same plant. Mrs. Hussey's figure (series ii. t. 31) has just the habit and many of the features of *A. leochromus*.

Agaricus (Pholiota) *capistratus*, n. s.; pileo carnoso, convexo, subviscido, margine involuto, substriato; stipite subæquali, farcto, crassi, subsquamuloso; annulo patulo, persistente, lamellis decurrentibus pallido. (Plate III. fig. 4.)

Pileus 2–3 inches, fleshy, convex, livid-tawny, rather viscid when moist, whitish when dry, margin folded inwards, obscurely striated. Stem 3–4 inches, thick, attenuated, subsquamulose. Ring large and spreading, persistent. Gills rather fleshy, crowded, decurrent, pallid. —On old stumps, elm, etc.; subcæspitose, taste rather unpleasant. Apparently not uncommon. Highgate.

Also allied to *A. pudicus* and to *A. cylindraceus*, from both of which, as well as the preceding, it may be distinguished, by its decurrent gills. It differs moreover in its more robust habit, and the folding in of the margin of the pileus.

AGARICUS (Flammula) *filiceus*, n. s.; pileo carnoso, convexo-plano, subtiliter flocculoso-squamuloso; stipite farcto, æquali, gracili; cortina fibrilloso-appendiculata, rubescente; lamellis confertis, adnatis, sulphureis, dein fulvo-cinnamomeis. (Plate III. fig. 1.)

Pileus 1–2 inches, fleshy, obtusely convex, at length plane, golden-yellow, minutely floccoso-squamulose. Stem $1\frac{1}{2}$–$2\frac{1}{2}$ inches, stuffed, equal, slender, yellowish. Veil adhering to the stem and the margin of the pileus in reddish fugacious threads. Gills crowded, adnate, of a sulphury-yellow, becoming of the colour of the pileus, and ultimately tawny cinnamon.—On old tree-fern stems. Cæspitose. A handsome species.

This plant belongs to the section *Sapinei* of Fries, but its claim to be considered British may be challenged. It occurred several times during last summer, on dead Fern stems, in the conservatory at Holly Lodge, Highgate, always near the summit of the stem, and proceeding from the bases of fronds grown in this country, never appearing on the lower and older growth. It is nevertheless interesting on account of its differing from its congeners, in not growing on Conifers, and hitherto undescribed.

AGARICUS (Hypholoma) *lanaripes*, n. s.; pileo subcarnoso, campanulato-expanso, hygrophano, squamis superficialibus secedentibus floccosis adsperso; stipite cavo, fragili, subfibrilloso, albo, basi tomentoso; lamellis confertis, adnexis, non ventricosis, ex albido fusco-purpureis. (Plate III. fig. 2.)

Pileus $1\frac{1}{2}$–3 inches, rather fleshy, margin thin, campanulate expanded, hygrophanous, squamose, with superficial scales arising from the breaking up of the cuticle, pallid, disk often tawny or brownish, margin purplish, with a shade of pink derived from the dark gills beneath. Veil attached in fugacious patches; the whole plant becoming of a dark-brown in decay. Stem 2–3 inches, hollow, fragile, subfibrillose, white, with radiating white hairs at the base (which are sometimes almost obsolete). Gills reaching the stem, not ventricose, crowded, whitish, changing to purplish-brown.

Subcæspitose. Found growing in a conservatory, where it was common, sometimes about the stems of plants in tubs, sometimes from the inner sides of the tubs themselves, and sometimes apparently from the soil. Occasionally rooting, when the hairs at the base were absent. Highgate, 1862.

This species is clearly allied to *A. Candollianus*, *appendiculatus*, and *hydrophilus*, but belongs to neither. The Rev. M. J. Berkeley considers it to approximate most to the first of these, with which he is well acquainted, but at the same time to be distinct.

BOLETUS *parasiticus*, Bull.; Berkeley's Outlines, p. 231. Plentifully at Combe Wood. September, 1862.

BOLETUS *sanguineus*, With.; Berkeley's Outlines, p. 231. Combe Wood. September, 1862. Decidedly viscid when moist. Just the plant of Sowerby.

BOLETUS *castaneus*, Bull.; Berkeley's Outlines, p. 236. Borders of Wood, Highgate. September, 1862, not common.

POLYPORUS *intybaceus*, Fr.; Berkeley's Outlines, p. 240. At the base of an Oak. Very large specimen, not less than 18 inches from base to apex. Caen Wood, Highgate. October, 1862.

POLYPORUS *giganteus*, Fr.; Berkeley's Outlines, p. 240. On an old stump. Hoveton, Norfolk. September 1861, and again in 1862.

TREMELLA *frondosa*, Fr.; Berkeley's Outlines, p. 286. On living Oak. Highgate, 1861. Caen Wood, 1862.

EXPLANATION OF PLATE III.

Fig. 1. *Agaricus (Flammula) filiceus.* 2. *A. (Hypholoma) lanaripes.* 3. *A. (Pholiota) leochromus.* 4. *A. (Pholiota) capistratus.* All natural size.

6, *Montague Place, Kentish Town, London, N.W.*

OPENING OF PALM SPATHES WITH AN AUDIBLE REPORT.

BY ALEXANDER SMITH, ESQ.

In the summer of 1861, it was stated to Dr. Seemann that a Palm spathe in the Royal Botanic Gardens at Kew had opened with an audible report. The case seemed to him so important, that he sent a notice of it to the 'Gardeners' Chronicle,' and thus was opened a very interesting discussion, by which many curious facts were elucidated. As the question is as yet far from being answered, it may be desirable to collect into one focus all that has hitherto been written on it, scattered as it is through several volumes of the 'Gardeners' Chronicle' and the

'Bonplandia.' This, and only this, I have attempted to do in the following compilation; and in hopes that residents in tropical countries may be induced to furnish us with the more positive information we require. I will only add, that when this discussion was first commenced, it was not noticed that the Palm at Kew, going under the name of *Seaforthia elegans*, and figured in the 'Botanical Magazine,' t. 4961, was not that of Brown, but a very different species, which Herm. Wendland has named *Ptychosperma Cunninghami*, the generic name of La Billardière (*Ptychosperma*) having the right of priority over that of R. Brown (*Seaforthia*). By the courtesy of Mr. M'Nab I am enabled to establish the identity of the Edinburgh and Kew plant, and in the following articles the correct nomenclature has been adopted. The old plant at Kew was received from Allan Cunningham in 1825, and is supposed to have been obtained at the Illawarra district; so it is probably the same mentioned by him as having been found there in his first visit (in 1818), and of which he says in his journal: "a Palm which I suspect is the tropical *Seaforthia*" (Conf. Heward's Biogr. Sketch). It is doubtful whether the genuine *Ptychosperma Seaforthia*, Miq. (*Seaforthia elegans*, R. Brown) is as yet in any of our gardens. That of the Crystal Palace is also *P. Cunninghami*. In confirmation that the Kew plant came from Illawara, my father says that when Allan Cunningham was describing its appearance and height, he told him that upon one of his excursions in that district he pitched his tent under a very lofty tree of *Seaforthia* standing singly, which from its great height and conspicuous position served as a landmark to guide him to his encampment; but that one day, when returning in the direction of his tent, he could not see the tree; and that when reaching the spot, he found it lying full length upon the ground, the natives having cut it down, much to his indignation, for the sake of its cabbage, which was then in the pot boiling for his dinner!*

* If Plate 4961 of 'Botanical Magazine,' representing *Ptychosperma Cunninghami*, be compared with the original drawing of *P. Seaforthia*, made by Bauer and preserved at the British Museum, the difference between the two species becomes strikingly evident. The leaflets of *P. Seaforthia* are always erose, those of *P. Cunninghami* acute or slightly bi- or trifid at the point. The spadix of *P. Seaforthia* is stiff and patent, quite green, and with isolated flowers; that of *P. Cunninghami* gracefully drooping, purplish, and with flowers arranged in clusters. The petals of the male flowers are oblong-obtuse in *P. Seaforthia*, ovate-acute in *P. Cunninghami*. The stamens are twenty-four in number, the filaments white and much longer than the petals, and the anthers linear in *P. Seaforthia*, and in *P. Cunninghami* the stamens are only eighteen in number, the filaments purple and scarcely longer than the

"About 11 A.M. on Sunday last, two young men (Gale and Hilary) employed in the great Palm-stove of the Royal Botanic Gardens, Kew, were startled by a report almost loud enough to have proceeded from a pistol. On looking round, it was found that one of the large *Ptychosperma Cunninghami*, Herm. Wendl., had burst its spathe, and in doing so forced off the remnant of an old leaf-stalk, about three feet long and more than a foot broad. For a long time Alexander von Humboldt (compare 'Views of Nature' and 'Cosmos,' vol. ii. p. 10) stood alone amongst the moderns as an observer of this curious phenomenon, which reminded him of Pindar's Dithyrambus on Spring, and the moment when in Argive Nemea 'the first opening shoot of the Date Palm announces the coming of balmy spring.' It was subsequently confirmed by Sir Robert Schomburgk ('Travels in British Guiana,' vol. ii. p. 376); but there has been no other confirmation, which renders the observation made at Kew highly acceptable. The sudden bursting with an audible report is probably due to a great accumulation of heat, developed by the anthers whilst enclosed inside the spathe. From the familiar manner in which Pindar alludes to this loud bursting, one would be inclined to infer that the phenomenon was a common one with regard to the Date Palm. Yet it is strange that we have no modern observations on that point,—at least I could find none when I wrote my 'Popular History of the Palms:' those of Humboldt and Schomburgk relating to *Oreodoxa regia*."—*Berthold Seemann*.†

"*Notes in reference to the Bursting of the Spathe of* Ptychosperma Cunnighami, *read before the Botanical Society of Edinburgh, and published in the 'Gardeners' Chronicle,' June* 25, 1862." By Mr. J. Sadler and Mr. W. Bell.

"The authors first referred to an article which had lately appeared

petals, and the anthers oblong. The drupe is red in the true *P. Seaforthia*, and if the drawing of *P. Cunninghami* may be relied upon in this instance (the flowers are stated not to have been succeeded by fruit), of an olive-green colour in the last-named species. I am not persuaded that Miquel's first two subdivisions of the genus are tenable, and I am not aware that Wendland has as yet published a description of his new species, and therefore subjoin a brief diagnosis:—*Ptychosperma Cunninghami*, Wendl. in lit.; caudice procero, petiolo tomentoso, pinnis angusto-lanceolatis apice acutis vel bi-trifidis, **subtus in nervo medio squamulis** magnis paleolatis, spathis 2, spadicibus floribus filamentisque purpurascentibus, spadicibus pendulis, floribus fasciculatis, florum masculorum petalis ovatis acutis, staminibus 18, antheris oblongis, drupis ovalibus, nucleo leviter 5-sulcato.—*Seaforthia elegans*, Hook. Bot. Mag. t. 4961, non R. Brown.—*B. Seemann*.

† 'Gardeners' Chronicle,' July 20, 1861, and 'Bonplandia,' vol. ix. p. 210 (August 1, 1861).

in the 'Gardeners' Chronicle' from the pen of Dr. Seemann, describing the bursting of a spathe of *Ptychosperma Cunninghami* with an audible report 'almost loud enough to have proceeded from a pistol,' in the Palm-house at Kew—the explosion being attributed to 'a great accumulation of heat, developed by the anthers whilst inside the spathe.' The authors then stated that they had had ample opportunities for observing the flowers of the *Ptychosperma* in all their different stages of development in the Palm-house at the Edinburgh Botanic Garden, and as yet had never seen anything which gave the least indication of a sudden rupturing of the spathe. In some cases they had seen the old foot-stalk of the leaf which covered the spathe fall off two or three days before the spathe showed any signs of bursting, and when it did burst it opened gradually from the base to the apex, generally on the dorsal aspect; indeed, they had only observed a single instance where the rupture occurred on the ventral side. Again, they had seen the spathe burst two or three days before the old foot-stalk fell off, and when it fell upon the floor it generally gave a pretty sharp crack, which they thought had been probably regarded as proceeding from the bursting of the spathe, as Dr. Seemann states that the spathe in bursting 'forced off the remnant of the old leaf-stalk.' When the spathe bursts previous to the fall of the foot-stalk that covers it, as soon as it is removed the branches of the spadix immediately expand, and, to all appearance, it looks exactly as if the spathe, in the act of bursting, had knocked off the foot-stalk. Dr. Seemann supposes that the report was due to an accumulation of heat, produced by the anthers. This, however, the authors thought could not be the case, as a considerable time elapses between the bursting of the spathe and the opening of the flowers; this they had never observed to be less than three weeks, and generally more than a month. A tree in the Palm-house at the Botanic Garden burst its spathe five weeks ago, and had not yet a single flower expanded. After the bursting of the spathe, the branches of the spadix continue to increase both in length and thickness, and until they have reached their maximum development they had never seen a single flower expand. Dr. Lindley, in his 'Introduction to Botany,' and Dr. Balfour, in his 'Class Book,' both state that the greatest amount of heat during the period of flowering is when the anthers are ready to discharge their pollen, after which it gradually declines. At the time the spathe bursts the flowers are in a very imperfect state, the stamens being very imma-

ture, with no traces of pollen. The observations of the authors went to show that there was rather less heat inside the spathe before it bursts than there was in the surrounding atmosphere. They had inserted a thermometer by a narrow slit into an unburst spathe, where they allowed it to remain upwards of twenty minutes, and when taken out it stood at 57½°, while the surrounding atmosphere was 58°. Taking into consideration the structure of the spathe, the authors showed that it was incapable of sustaining any great amount of pressure, as it was found, when in a fresh state, to tear lengthways with as little resistance and with as little noise as a piece of soft blotting-paper."

To these notes Dr. Seemann replied, in the 'Gardeners' Chronicle,' February 8, 1862, and 'Bonplandia,' vol. x. p. 49, as follows:—

"In a paper read before the Botanical Society of Edinburgh, on the 9th of January and reported in the 'Gardeners' Chronicle' of the 25th of the same month, the correctness of an observation I published in this Journal, has been called into question by Messrs. Sadler and Bell. The authors endeavour to prove that the two young men who heard the report made by the *Ptychosperma Cunnighami* in the Great Palm-house at Kew were so far mistaken that it was not caused by the bursting of the spathe, but by a pretty sharp crack which the foot-stalk of the old leaf is said to give when dropping on the floor. Casual visitors of the Great Palm-house might be startled by the remnant of a huge leaf suddenly falling on the floor, but this could not possibly deceive men like Messrs. Gale and Hilary, daily employed amongst Palms, and consequently perfectly familiar with such an occurrence. The fact that no audible report was heard in Edinburgh does not, in my opinion, invalidate the evidence I collected at Kew. I never maintained that all spathes do open with an audible report, but I am convinced that the one at Kew did so. The slightest slit in the spathe would probably be quite sufficient to prevent its opening with any report. Of course this must be a matter of mere conjecture until we shall know more about the subject, and Messrs. Sadler and Bell will have rendered good service if their objections, whether well founded or not, induce those who can bring positive facts to bear upon the question to communicate them. Dr. George Bennett, at Sydney, author of the 'Wanderings in New South Wales, Batavia, etc.,' and 'Gatherings of a Naturalist in Australia,' wrote to me only by last mail that he had

read my communication relating to the bursting of the Palm spathe with great interest, because, during his stay in Ceylon, he had *often observed* this curious phenomenon. I trust that when my friend reads this note he will hasten to communicate all he knows on the subject, and on what Cingalese Palms he noticed the bursting. With regard to the cause of the report, I left it quite an open question, and merely threw out a suggestion that it might be owing to heat generated by the anthers. Messrs. Sadler and Bell inserted a thermometer by a narrow slit into an unburst spathe, and when taken out after a lapse 1½ of twenty minutes, it was found to be ~~a half a~~ degree lower ($57\frac{1}{2}°$) than the surrounding atmosphere. To my mind the observation as given does not prove anything at all. In order to have any value, we ought to know the range of the thermometer in the house during at least twelve hours previously, and the time of day when the observation was taken. If the atmosphere surrounding the plant had not fluctuated during the last twenty-four hours, the observation would tend to prove that there was no heat developed inside the spathe; but if the range of the thermometer had been considerably lower a few hours, or perhaps even a still shorter time before, it would go some way to prove that a certain degree of heat was thrown off by the flowers. We have as yet very few exact observations on the development of heat in flowers; Caspary's on *Victoria regia** are perhaps the most minute ever made known, and that able botanist confirms the fact that, not only is the greatest amount of heat generated when the anthers are ready to discharge their pollen, but that there is at different times of the day a maximum and a minimum independent of the surrounding temperature."

This communication was followed by the two succeeding letters, both published in the 'Gardeners' Chronicle' (March 1 and 22, 1862):—

"Yesterday I received some information likely to throw a new light upon the probable cause of the audible report by which the opening of the Palm-spathe at Kew was accompanied, or at least lead our inquiries into a new direction. My friend, Professor Gœppert, of Breslau, writes to me* that, wishing to show to his botanical class the internal structure of a female cone of *Zamia integrifolia*, he made a transverse section in the presence of his pupils, when, to their mutual surprise, an audible detonation was distinctly heard. All present having agreed that this report could proceed from no other source than the cone ex-

* 'Bonplandia,' vol. iii. p. 178–199 (1855). † Ib. vol. x. p. 59.

hibited, Professor Gœppert, without loss of time, made another transverse cut, when again a report, though not so loud as the first, was heard. This experiment was then tried on a second very much smaller cone, and again a report was heard, though this time rather faint. Thinking that the cause might perhaps be sought in heat accumulated inside the spadix, a thermometer was inserted, but found not to be affected by this process. Professor Gœppert thinks that compressed air may perhaps be the cause of this singular phenomenon, but does not venture to pronounce an opinion in the absence of further experiments. As there are numerous large Cycads in England bearing cones, he hopes that his accidental observation may stand a fair chance of being corroborated in this country."—*Berthold Seemann.*

James Yates, Esq., F.R.S., to Dr. Seemann.

"Lauderdale House, Highgate, March 9, 1862.

"Although I have never seen or heard the explosion of which you speak in your letter to the 'Gardeners' Chronicle,' I remember an occurrence in my collection of Cycads, which may assist in furnishing some answer to your question. In the year 1851, the large *Encephalartus horridus*, in my Palm-house, produced a cone of enormous dimensions. It is a female. In July the cone was quite mature. The rhomboido-peltate terminations of the scales had begun to separate, so as to show the orange-coloured drupes beneath them. On one occasion, when I went to look at the plant, I was surprised to find that the scales had fallen from at least two-thirds of the axis, and had evidently been projected from it with some force, since, besides being scattered on every side, some of them were enveloped and fixed among the leaves. In fact, it appeared to me that the cone had exploded. The *modus operandi* seemed to be the following:—When the proper period arrives, the scale separates from the axis exactly as a leaf separates from the branch on which it grows. Dr. Thompson, of Liverpool, thinks this is effected by a deposition of starch at the place of attachment. However this may be, there is a natural joint at the base of the scale of a female Cycad, just as there is in leaves, and even in leaflets at their points of attachment to the stalk or branch. Whilst a preparation is thus made for the separation of all the scales from the axis, the drupes increase, so that their extremities, which are directed towards the axis, press with more and more force against it. At

length the moment arrives when the pressure against the axis is so strong, and the attachment of the stalks to it so weak, that a hot gleam of the sun is sufficient to detach the scales with sudden violence. In considering these appearances at the time when they presented themselves, it seemed to me that the process might aid in the dispersion of the seed. The leaves encompass the cone on every side, and form so dense a circuit, that the escape of the drupes appears impossible. The explosive faculty of the mature cone may overcome this difficulty. I may add that, if you examine the axis of the female cone of an *Encephalartus*, you will see that the scars, showing the attachment of the scales, are smooth, because the vessels in the bundles of woody fibres have closed. According to the preceding explanation, the phenomenon is analogous to the dispersion of seed in many other cases. On a hot summer's day, walking beside a hedge of *Ulex Europæus* or *Spartium scoparium*, I have listened with much interest to the crackling of the ripe pods. A circumstance occurred here two or three years ago, which may throw some light on the subject. Certain members of the family were seated one summer's day at an open window looking into the garden, when they were startled by a noise. It appeared to have proceeded from the sudden expansion of the leaves of a large and fine *Fourcroya gigantea*, which were, till then, closely wrapt round one another." —*James Yates.**

Another singular instance of detonation was communicated ('Bonplandia,' vol. x. p. 85) by Mr. Smith, of the Royal Botanic Gardens, Kew:—"More than thirty years ago I and my family were roused from a sound sleep by what we took to be a discharged pistol, and proceeding from the lower part of the house. The thought of being surprised by housebreakers was so uppermost in my mind, that I instantly struck a light, and, arming myself with the only weapon at hand, a poker, descended downstairs. Fully expecting to encounter a strong smell of gunpowder and a gang of thieves, I opened the door of the room whence the sound had come. To my surprise, I found neither the one nor the other, the room being undisturbed, and nothing to be seen. But, on advancing, my bare feet trod upon several sharp things, which, on closer inspection, turned out to be the *cocca* of *Hura crepitans*, the Sandbox-tree. The mystery was solved. We had a

* Also published in 'Bonplandia,' vol. x. p. 86.

fruit of that plant as an ornament on the chimney-piece, and its sudden explosion was the cause of our being awoke from a sound sleep in the upper part of the house. The different *cocca* had been propelled in every direction of the compass."

Meanwhile, a letter had arrived from Dr. George Bennett, of Sydney, which was published in the 'Gardeners' Chronicle' of the 19th of July, 1862:—

"With respect to the opening of the spathes of Palms with an explosive sound, I was not aware there was any doubt on the subject, until I observed the remarks following Dr. Seemann's communication in 'Gardeners' Chronicle' and 'Bonplandia.' It has been asserted in many works, more particularly with reference to the Talipot Palm (*Corypha umbraculifera*), that 'it bursts with a loud report, which may be heard at a considerable distance.' As far as my knowledge goes this is an exaggeration, for the spathe of that Palm, as in all those I have observed, when it expands only produces a slight explosive sound, more or less loud, but audible only to an attentive observer. This I have remarked in Ceylon, in the Cocoa-nut and *Caryota urens*, as well as the Betel-nut, but I have no doubt it obtains in all Palms; yet I do not consider it occurs in every spathe that opens, as that phenomenon would depend upon the greater or less quantity of air contained within, for I do not regard the explosive power to result from any accumulation of heat, but from compressed air. The expansion of the spathe occurs at all times of the day. The Palm spathes, it may be remarked, expand when in a green state, and the same circumstance occurs in peas, beans, and other leguminous plants when opened artificially, the explosive sound being emitted in them (according to the compressed air within) to a greater or lesser degree, and sometimes not at all. It may also be produced in the pods of the *Gomphocarpus* or Cape Cotton shrub, the Bombadero of the Portuguese (*Asclepias*), Bladder Senna (*Colutea*), and many others. Many of the pods of the leguminous trees, when ripe, may frequently be heard expanding with a slight noise on shedding their seeds. The reason it is doubted is probably that few persons have paid much attention to it, or had an opportunity of making observations in large groves of Palms, such as may be seen in Ceylon, South Sea Islands, etc., or had the patience required to watch the result. As we have now growing in the Sydney Botanic Gardens specimens of *Ptychosperma*, *Cocos plumosa*, and Date Palms,

bearing spathes, experiments may be tried artificially when an occasion again offers whether any explosive sound results on their being opened, although, from what I have observed formerly, the result would not be decisive from a few solitary examples."—*George Bennett.*

'*Remarks on the Bursting of the Spathe of Palms, and Opening of Leguminous Fruits,*' by Mr. J. Sadler, and read before the Botanical Society of Edinburgh (Dec. 11, 1862), complete all the evidence that at present can be offered.

Mr. Sadler gave the views of different authors regarding the bursting of the spathe of Palms with an explosive report. That some species of Palms in their native habitats may make, while bursting their spathes, a sound, caused by compressed air, audible to a very attentive ear, he did not deny; but he was of opinion, from certain experiments which he and others had made on *Ptychosperma Cunninghami*, that in this country no indication of a report (as affirmed by some) was met with. The author then explained that the crackling sound of various leguminous fruits while shedding their seeds was not (as supposed) due to heated or compressed air, but to the shrinking or tension of the tissues. He concluded by reading extracts from a letter which he had received from Mr. W. Bell, of Saharunpore Botanic Garden, in which he stated that, from all the information he had gathered at Ceylon, Calcutta, and elsewhere, he could find nothing to support the theory of explosion caused by heat developed within the spathe.

ON THE TERTIARY FLORA OF THE ARCTIC REGION.

BY PROFESSOR H. R. GŒPPERT, OF BRESLAU.

(*Translated from the Bulletin of the Russian Academy*, iii. 448.)

It is more than probable that at the commencement of every geological epoch a change of climate took place, and that even in the Tertiary period our own regions enjoyed a higher mean temperature than they do at present. Whether this was the case in the higher latitudes was formerly but little discussed, although the existence of considerably large trunks of bituminous woods in countries like Iceland, Greenland, and Northern Siberia, where at present only *shrubby* vegetation is met

with, would have justified the conclusion that formerly a higher temperature existed there. For the first more direct proofs, science is indebted to M. Adolphe Erman,* who collected as early as the year 1829 at Sedanka, in Kamtchatka, between lat. 59° and and 63° N., especially at the mouth of the Tigil, and in a very hard sphærosiderite, from a formation extending very far along the coast, about lat. 63° N., not only petrified woods but also leaves, which plainly showed a relationship with the Tertiary flora of central Europe, and consisted of different species of *Juglans*, *Carpinus*, and *Alnus* (the latter resembling *Alnus Kefersteinii*, so abundant in the Miocene flora). Another specimen in sphærosiderite submitted to me, I hold to be *Juglans acuminata*, A. Braun,† a plant very common in both the upper and lower Miocene formation (at Öningen and in Switzerland [Salzhausen], but not at Schosnitz, as the nervature shows that our species referred here by Heer do not belong to it; this is especially the case with regard to *Juglans Sieboldiana*, of which *J. pallida* may perhaps be considered a recent form, while *J. salicifolia* appears to be nearest related to *J. Bilinica*). The same specimen exhibits a rather imperfect leaf of an *Acer*, different from all fossil species known to me, and a very minute leaf, perhaps of *Taxodium dubium*. M. A. von Mittendorff afterwards collected in a treeless district of lat. 74° N., different fossil woods, belonging to *Coniferæ*, which I have described and figured in the first volume of his 'Travels in Siberia,' but which their discoverer regards for the most part not as indigenous, but as driftwoods, although a great proportion of the fossil wood found in such quantity in the *tundra* of northern Siberia must be regarded as *in situ*, having been met with in alternate strata in sandstone by Figurin, on the Lena, and by A. G. Schrenk,‡ in the *tundra* of the Samoyedes. In the most essential part of these conclusions M. von Mittendorff agrees, when he says that all the fossil woods and coals hitherto found in the Taimyr country must be regarded "as belonging to recent geological formations." If this is the case with the fossil woods described by me, *Pinus Mittendorffiana* and *P. Bæriana* are those fossil plants, hitherto found furthest to the north. On the other hand, the so-called Noah or Adam woods of northern Siberia may be regarded as driftwood. The wood which M. von Mittendorff

* A. Erman, 'Reise um die Erde,' p. 149. Berlin, 1848.
† O. Heer, Flor. Tert. Helvet., t. 128, fig. 7.
‡ Reise nach dem Nordosten des europ. Russlands, vol. i. p. 675. 1847.

gathered in the Taimyr country, on the banks of the Taimyr, lat. 75° N., and close to the skeleton of a mammoth, and of which he also forwarded a specimen to me for examination, was neither petrified nor bituminous, but of a light grey colour, and not quite so heavy as wood that has been some time in water, and has thus lost part of its specific gravity. I could distinguish two species; the structure of the one showed an unmistakable resemblance to the Larch (*Larix Europæa*), which cannot be distinguished structurally from *Larix Sibirica*, and may therefore be derived from *Larix Sibirica*, widely diffused over Siberia, between lat. 67° and 68° N., though not as far as lat. 75° N. The other species exhibited the type of the genus *Abies* (that of *Pinus Abies*, or the Siberian *Pinus obovata* and *Pichta*, both not extending beyond lat. 69° N.), and might therefore belong to one of the latter species, but that could not be said with certainty. However, the occurrence of fossil and bituminous woods in these high latitudes is, according to M. von Helmersen, a geological phenomenon of enormous geographical extension. A similar statement has recently been made by Chitrow in his description of the Jiganeck country, situated on both banks of the Lena, between lat. 65° and 73° N., and long. 127° and 148° W.* M. von Brevern found in Kamtchatka, on the rivulets Aiskowo and Tchaibucho, anthracite, and amongst it bituminous woods and amber, which C. E. von Mercklin, through M. von Helmersen's instrumentality, was able to examine, and describe and figure in his celebrated work 'Palæodendron Russicum,' under the name of *Cupressinoxylon Breverni*. Fossil and bituminous woods are also met with in the islands called New Siberia, lat. 75° N.; and Pschenizyn found in the island of Kotelnoi whole beds of petrified woods, and, if I remember right, he also discovered there the so-called "wooden hills"—enormous deposits, thirty fathoms high, composed of horizontal layers of sandstone with bituminous tree-stems, which at the top of these hills are erect, and may be seen from a distance of five versts.

Impressions of leaves, so essential for a more exact determination of the formation, I have as yet not obtained from regions so far north, but I have them (1) from northern Greenland, near Anonak, about lat. 73° N.; (2) from Iceland, lat. 65°; and (3) from the Aläksa Peninsula and the adjacent Aleutian Islands, south of Behring Strait, about lat. 59° N.

* Extrait des Publications de la Société Impériale Géographique de Russie, p. 242. St. Petersb., 1859.

I. In Greenland there are, as far as lat. 71° 30 and 73° N., even at a height of 2000 feet, very extensive coal-beds with carbonized and flat-pressed trunks of *Cupressineæ* and *Abietineæ*, 2–3 feet in diameter; in some places, as at Harsonec on Hare Island, they are mixed with amber-like resin, and have been described by Mr. Vaupell as *Pinites Rinkianus*.* According to Mr. Rink, the most remarkable are the so-called arborescent coals, which the ice descending from the heights of the country as far as Assakak (lat. 71° N.) in the Omenaks Fjord, conceals close below its surface. Mr. Rink conjectures that these coals are broken off about a league from the coast, and at a height of 3000 feet, by the glacier ice, and carried along by it; and that it is highly probable that the trees to which they belong, grew in that locality and at one time formed a forest there. Of the coal-beds near Atanekerdluk (lat. 70° N., long. 52° W.), I saw impressions of leaves in a grey clay in Mr. Forchhammer's collection at Copenhagen, gathered 1100 feet above the sea, and amongst them recognized *Dombeyopsis grandifolia*, Unger, a widely-spread plant of the European Miocene formation, occurring near Bonn, at Prevali in Carinthia, Bilin in Bohemia, and Leoben and Kainberg in Styria, at Öningen, in the Upper Bruche in Baden, at Lausanne, and in northern and southern Elgg in Switzerland, and at Grünberg in northern, at Kreidelwitz, Striese, and Schmarker in central Silesia. I also saw in a yellowish sphærosiderite, having an extraordinary resemblance to that of Kamtchatka, *Sequoia Langsdorfii*, Heer, a plant so widely spread in the upper and lower Miocene rocks that it can hardly be regarded as anywhere wanting, as in Prussia, near Rauschen in Silesia, Salzhausen, Westerburg, and Dernbach in Nassau, Münzenberg near Rott, and Quigstein near Bonn, at Kaltennordheim in Thuringia, at Seisen near Beyreuth, in the Cracow district near Sworzowice, at Tallya near Tokay in Hungary, Wildhut, Koflach, and Zillsingsdorf in Austria, on the Rossberg and Eriz in Switzerland, at Öningen, and in the Arno valley in Sinigaglia in Italy. Quite recently it has been found in the Kirgis steppe (Abich); and it is probably also to be met with in N.W. America, in Vancouver Island (lat. 58° N.), whence Lequereux has described a not inconsiderable number of species, which place the extension of the Miocene flora in those latitudes beyond doubt. The

* 'On de geographiske Beschaffenhed af de danske Handelsdistricten i Nordo-grönland,' af H. Rink, p. 62. Copenhagen, 1852.

presence of both plants in the locality of Northern Greenland I have named, and that of the trunks, justify us in concluding that at least the coal-beds (so much worked) belong to the Miocene formation. Whether the same may be said of the other sixteen which Mr. Rink, the present Governor of Greenland, mentions, I am not prepared to maintain. I received from that gentleman a rather dark mica-slate from another district, the coal formation at Kook (lat. 70° N.), containing *Pecopteris borealis*, A. Brongn., and curiously enough a very well preserved *Zamites;* also a *Pinus* with fascicles of three leaves, and a leaf much resembling those of *Sequoia Langsdorfii*, but being rather blunt, so that I am not quite decided in my opinion on this formation. Another place touched at by Captain Ingelfield, at Four Island Point, also appears to contain Tertiary plants.*

II. Not less extensive coal-beds, called Surturbrand, are met with in Iceland under similar conditions to those existing in North Greenland, and already described by Olafsen.† According to his statement, they have in some places well preserved flexible leaves of Oaks, Willows, Birch, Elms, Maple, and *Coniferæ;* and this statement is

* From a daily paper of the year 1854, containing Captain Ingelfield's report of his Arctic expedition, we extract the following:—

"It is well known that Captain Ingelfield (H.M.S. Phœnix) went to search for a passage to the North Polar basin, between Greenland and the continent of America, and on the 8th of July, from Four Island Point, he addressed a report to the Admiralty, from which we cull the following:—'On a hill, 1084 feet above the sea, we found large remnants of fossil trees, although they were almost entirely embedded in sphærosiderite. The specimens we collected were in various stages of petrifaction, and some changed into coal. That at one time this forest had a considerable extension, and that the species of tree composing it were doubtless such as are now encountered only in milder climates, was sufficiently proved by specimens of fossil leaves plainly belonging to Linden, Beech, Fir, and Ferns. To the geologist this locality is of the highest importance, and deserving of further investigation. We found a small piece of amber, and I succeeded, although with great difficulty, in reaching a place on the corner of the cliff, where part of a half-petrified tree still stood in an angle of forty-five degrees towards the north; the hill on which the wood was situated presenting its front towards the south. This tree was about as thick as a man's body, and four feet of it were aboveground. I must pass over a detailed description of the geological formation of this district, better suited for a scientific journal than an official letter, and will only add that traces of greenstone, sandstone, schist, and basalt were observed at a short distance from our anchorage, and that we also found gneiss there. On the following morning we weighed anchor and passed through Waigattet to Ritenbenk Rullrud. On landing, I soon found coal-beds, which, as far as my observation went, extended for more than a mile along the coast. They are from three to six feet deep, and contain anthracite.' Captain Ingelfield then goes on to say that he sent his boats on shore, and in four hours took in twelve tons of coal of good quality."

† 'Reise durch Island,' p. 219. 1774.

confirmed by Krug von Nidda.* Gliemann† mentions the impressions of Mountain Ash fruits, and leaves as large as a hand nearest resembling those of oaks, perhaps *Dombeyopsis*, and Ebel‡ notices even a leaf like that of *Liriodendron tulipiferum*, a genus which, as is well known, has been discovered in the German, Swiss, and Italian Miocene flora, and it really does exist in Iceland, as may be seen from the preliminary description of a rich collection of Icelandic Tertiary plants gathered by Messrs. Steenstrup and Winkler, to which O. Heer§ had access.

Of thirty-one well-determined Icelandic fossil plants, to which I have to add another species, sixteen are common to the European Miocene flora, amongst them are thirteen woody plants, and, curiously enough, just those species which were most abundant in Iceland, and, therefore, most probably those formerly constituting the forests there. Consequently, the European forest flora, as represented by thirteen woody plants, extended at that period as far as Iceland, but preserved even there its thorough North American character. A well-explored locality, Hradavatu in Nordvordal, in the north-western parts of the island (64° 40′ N. lat., and about 3° 20′ W. long.), appears, according to Heer, rather more recent, more closely related to the Öningen formation and the flora of Schosnitz, near Breslau, by the occurrence of the *Alnus (Betula) macrophylla* and *Platanus aceroides*, so abundant at the latter place; and it therefore, perhaps, belongs to the upper Miocene. During my stay at Christiania in August, 1859, Mr. Kjerulf gave me from the latter locality two plants; the one being *Alnus macrophylla*, the other, *Planeria Ungeri*, new in this locality, and very interesting on account of its wide distribution in the whole Miocene. Its southern limit is on the Montajone in Sinigaglia, the eastern near Tokay and Schosnitz, and the western in the Canton Waadt. The most widely-distributed tree of Tertiary Iceland was, according to Heer, the large-fruited Maple (*Acer otopterix*, Gœpp.), which I found in fruit at Striese, a rather older formation of Silesia than that at Schosnitz, and to which, in Heer's opinion, the leaves from Schosnitz, described under the name of *Acer triangulilobium*, may probably belong. According to Steenstrup, in the

* 'Geognostische Darstellung der Insel Island,' in Karstens Archiv, vol. vii. p. 501. 1843.

† 'Geographische Beschreibung von Island,' Altona, 1824.

‡ 'Flora Tertiaria Helvetiæ,' parts 7 and 8, p. 316.

§ Geogr. Naturkunde, p. 154. Königsberg, 1850.

Trap formation of the Faröe Islands, especially in Suderöe, lignite occurs under very similar conditions. Whether the bituminous and petrified woods, found by M'Clure in Banks Island, lat. 75° N., may here be classed, I am unable to say.

III. In August, 1859, M. von Pander and General von Hofmann forwarded to me a rather extensive, but unfortunately rather imperfectly preserved collection of fossil plants, which Lieut.-Col. von Doroschin made in the Aläksa peninsula, the western part of Russian America, and on the adjacent Aleutian islands, Kodjäk, Uyak, Atcha, and Hudsnoi, about lat. 59° N. By far the greater part belongs to the Tertiary, a smaller to older formations.

A. *Tertiary Formation.*

1, *sub* No. 10. Four pieces in a grey, rather hard, slightly calcareous and slaty rock, said to be from strata which are mixed with lignite, from the Bay of Ugolni, a part of the Kenaic Sound of the Aläksa peninsula. Three specimens of leaves, all of them only accidentally preserved in the central parts,—leaves with stiff, acutangular lateral veins, such as we have in *Carpinus.* A more certain determination is impossible, although they doubtless belong to already described species. Nor can the fourth specimen, a stem with parallel striæ, similar to *Phragmites Œningensis*, Heer, but without *nodes*, be determined with more certainty.

2, *sub* No. 11. Eleven specimens, in a soft and fragile clay, of a light grey colour, and very similar to that of Öningen, and more especially that of Schosnitz; according to M. von Doroschin, collected near the village of Neniltchik, on the eastern shores of the Kenaic Sound, and in strata mixed with lignite.

a. The central part of a willow-leaf, perhaps that of *Salix Wimmeriana*, a species which I cannot unite, as Heer has done, with *Salix varians*, and which, in the rounded form of its base, differs much more from *S. varians* than Heer's *S. macrophylla* from *S. varians;* the latter I have seen of the same size as Heer did at Öningen in Schosnitz, without being able to regard it on that account as a distinct species. Pieces of *S. caprea*, cut or broken off, I saw making leaves 6 inches long and 2½ inches broad.

b. Leaf of a *Salix* not quite agreeing with any known species, but coming nearest to *S. integra*, Gœpp., which is found besides at Öningen

in Schosnitz; it might be figured on account of the variability to which the form of the willow-leaf is subject, but could hardly be made a distinct species.

c. A willow-leaf, the lower and visible surface of which is covered with numerous, thin, longitudinal striæ, which conceal the veins, but are in their distribution quite independent of them; these striæ may, in my opinion, be caused by hairs, in which case the leaf would belong to a new species, a hairy willow-leaf in a fossil condition having as yet not been met with.—*Salix pilosula*, Gœpp.

d, e, f, g, h. Alnus pseudoglutinosa, Gœpp., three imperfect specimens, but two of them with the obtuse point of two isolated female catkins, which may perhaps belong to them.

i. Caulinia lævis, Gœpp., described by me from the Miocene lignite formation at Striese in Silesia,* belongs perhaps to *Phragmites Œningensis*, which since then I have found undoubtedly near Grünberg in Silesia, also in Miocene. From the same stratum as No. 2 and in the same situation, but according to the schedule close to a so-called "coal-conflagration," two specimens of red-burnt clay, one of them with a leaf of *Taxodium dubium*, the other, unfortunately only partially preserved, but still with an impression deserving to be figured, similar to an evergreen Oak,—a genus to which we have been compelled to refer, from want of flowers or fruit, so many a leaf probably belonging to a very different source. *Taxodium dubium*, very close to the *T. distichum* of the existing flora, belongs like *Sequoia Langsdorfii* to the most widely diffused plants of the whole Miocene formation, being met with in Vancouver Island, Bellingham Bay in the Washington territory, probably also in Kamtchatka (see above), in eastern Prussia, Schosnitz in Silesia, at Bilin in Bohemia, Parschlug in Styria, Seesen near Beyreuth, on the Hohen Rhonen, Schangnan, Eriz im Sandstein von Rallingen, Lausanne in Switzerland, Öningen, in Baden, in the Arno valley and Sinigaglia in Italy, and in the Kirgise steppe.

3. From the western shores of the Kenaïc Sound and the peninsula of Taketchek or Osipnago, in a light grey schist, five isolated fragments, *sub* No. 15, in which *Sequoia Langsdorfii* and single leaves of *Taxodium dubium* are embedded. Also from the western shores of the Kenaic Sound (Beketinzisnakiknu) *sub* No. 26, two specimens of branches of

* 'Beiträge zur Tertiärflora Schlesiens.' 1852.

Pinites, petrified by calcareous agents; a second specimen of rubbed wood with bored holes, having the character of driftwood: probably from a secondary deposit.

4. From the north-eastern shores of the Aläksa peninsula in the Katmaic Sound, *sub* No. 87, three small fragments, with single leaves, of *Taxodium dubium.*

5. From the eastern shores of the Aläksa peninsula (the south-western shore of the Nukhalilek Sound) in sandstone, internally grey, externally reddish, two specimens, *sub* No. 132; the one a branch of *Taxodium dubium;* the other, merely fragments of leaves and branches of the same plant.

6. From the island of Unga on the shores of Aläksa (the western shore of the Sacharosch Bay), from layers mixed with lignite, *sub* Nos. 210 and 223, slate, rich in oxide of iron, and externally resembling the sphærosiderite of the coal formation, quite filled with isolated pinnæ, reminding us of *Neuropteris*, the venation of which, it will be remembered, can only be compared to that of *Osmunda*, or *Anemia*, and certain species of *Allosurus* of the existing vegetation, so that one would be reminded of the true coal formation, if the presence of *Sequoia Langsdorfii* in the same specimen did not point to its Tertiary nature. In honour of the discoverer, I shall name it *Osmunda Doroshiana.*

7, *sub* No. 213. From the western shores of the south-western extreme end of Unga Island. Fragment of a petrified trunk, externally decomposed and whitish, internally still black, like the so-called Wood-opal of the Hungarian Tertiary formation, of the same internal structure, and not to be separated from my *Pinites Pannonicus.* The lake again is identical with *Pinites Protolarix*, so widely diffused in the whole Miocene formation of Germany, and the first described from the lignite formation. It is also a proof of the relationship of a formation so far removed from us geographically.

8. From Atcha Island, *sub* No. 270, a petrified bituminous wood (*Pinites*) of a Tertiary species, characterized by extremely numerous medullary rays.

9, *sub* No. 331, two specimens of a very black, hard schist from the island of Hudsnoi, near Sitcha.

a. On one side *Populus eximia*, Gœpp., which though only partially preserved, is easily recognized; it is that form which I figured in t. iv. fig. 3, of the 'Tertiary Flora of Schosnitz in Silesia,' and which

Heer united with my *Populus balsamoides* of the same locality. It differs strikingly in the totally dissimilar form and size (4–5 inches long and 3–4 inches broad), and the crenulate, not serrated edge of the leaf. The allied *P. balsamoides* is found besides at Schosnitz in Silesia,* at Lausanne in sandstone, and in the marl of the tunnel near Neftenbach and Rorbac on the Jechel; also on the Albis in Switzerland, and in white marl, near Günzburg on the Danube. On the other side there is merely a fragment, unfortunately, of a leaf, which reminds us of *Juglans*, resembling *J. acuminata* by its lateral veins, which are connected by sunken, nearly rectangular veinlets.

b. A specimen of *Taxodium dubium* in a younger and older stage, and with very perfect branches: a strikingly blunt-leaved form which, though there already exist numerous representations of the plant, deserves to be figured.

B. *Older Formations.*

I regard in the collection before me, as not belonging to the Tertiary formation, No. 94, a rather hard, grauwacke-like specimen, here and there with parallel-striped, but not jointed imprints, with an anthracite covering, gathered on the north-eastern bank of the Aläksa peninsula, north of Jaklek, on the southern shore of a rivulet; also six specimens sent, *sub* No. 143, three of which also are in grauwacke-like rock; two resemble *Calamites*, one, a fern-stipe having lost its leaflets; two in black schist, with talc-like, shining leaves, probably fragments of *Sigillaria*

* Our flora of Schosnitz, in this respect doubly curious, was on its discovery in 1832 quite isolated, and when describing it ('Die Flora von Schosnitz in Schlesien,' Görlitz, 1855, with 26 plates in 4to and 400 figures), I declared it to belong to the Pliocene formation, on account of its difference from all Tertiary floras then known, and its close relationship with the existing vegetation; but after the publication of the quite analogous floras of Oningen, Schootzburg, and several places in Tuscany (especially Montagone), it must be regarded as Upper Miocene. The recent discovery of an undoubtedly antediluvian tuff, in the Schosnitz deposits, promises to reveal still more. At one time the flora of the amber, which with us in Silesia had hitherto been met with exclusively in the diluvium, but more recently in two places at a depth of six and sixteen feet in Lignite clay, was regarded by me from similar reasons as Pliocene, especially on account of its great similarity to the existing flora, and the absence of the woods containing amber in substance, the Lignite of the Samland; it is however to be classed with the latter (Pliocene), although, in 1853, in my enumeration of all Tertiary plants then known ('Tertiärflora von Java') I declared it to be Miocene. From the recent investigations of Zaddach it would even appear that we may look for it as low down as the chalk formation. I will add that, years ago, Glocker found amber in Quellen sandstone of Mähren, and Reuss in that of Bohemia.

leaves. I hold the formation to be grauwacke, although I am prompted to offer this opinion, not from the very imperfectly preserved plants, but from an empiric view which a long study of this formation has enabled me to form; and I should not allude to it at all, if it were not that my hint might lead to the discovery of its true position, and then to that of the productive coal-beds so frequently associated with it.

On returning to the Tertiary formation of the above-named regions, we find that we have fragments of seventeen plants (of which, however, only twelve can be made out with certainty); they have been collected in nine different places, the distances of which from each other are however unknown to me, so that I have no opinion about the range of this formation. At the same time, a relationship amongst them cannot be gainsaid, established as it is by two species, common to nearly all localities, and justly entitled on account of their wide, already explained range, to be regarded as the *leading* plants of the Miocene formation, viz. *Sequoia Langsdorfii* and *Taxodium dubium*, which, in conjunction with the other species, place the Miocene age of these strata beyond doubt. True, the materials at my disposal are not sufficient for a more exact classification; but of the collection enumerated *sub* No. 2, consisting of ten specimens, it may perhaps be said that the occurrence of willows and other species allied to the flora of Öningen and Schosnitz justifies us in regarding them as rather more recent than the others, and perhaps as belonging to the upper Miocene strata. Finally, it is hardly necessary to add that in all these places a much greater abundance of fossil species must exist, and that, by further investigation, the Tertiary flora of Russia will receive considerable additions.

On reviewing the extensive range of the flora of the Miocene formation already ascertained to exist in the Arctic and subarctic region, in the Aleutian Islands, Greenland, Iceland, and Kamtchatka, perhaps also extending over the northernmost parts of America, North Siberia, and the islands of the Icy Sea (whence may be derived fragments of lignite, here and there mixed with amber, which occur, according to Lapechin,* Georgi,† and Schrenk, on all the coasts of the Arctic Ocean),

* Reise, vol. iv. p. 106.

† 'Beschreibung des russischen Reichs,' vol. i. pp. 333, 334.

we may assume that regions at present so inhospitable possessed at the Miocene period a milder climate, a mean temperature of at least 8° to 9° Réaumur, in order to favour a vegetation such as is found in our days only in the central and southern parts of North America and Europe, the floras of which, especially that of North America, agree in their general features best with that of the Miocene period.

REVISION OF THE NATURAL ORDER BIGNONIACEÆ.

By Berthold Seemann, Ph.D., F.L.S.

Stenolobium, *D. Don.*

This genus was founded by D. Don in 1823, some years prior to Mr. Bentham's Papilionaceous genus of the same name. As the type of D. Don's *Stenolobium*, I regard the simple-leaved form of *Tecoma stans*, which De Candolle has described as *Tecoma Gaudichaudi*, and D. Don as *Stenolobium castaneæfolium*. *Stenolobium* is easily distinguished from allied genera by its regular 5-ribbed and 5-toothed calyx, infundibuliform corolla, included genitals, divaricate anthers, and siliquose, flat capsule, with a septum bearing only one row of seeds on each side. The anthers are villose or quite glabrous, and offer good *specific* characters, but I do not regard them of *generic* value, and think that the independence of *Craterotecoma* and *Lundia*, both of which are retained principally on account of their villose anthers, is very much shaken by the observation, that in a truly natural genus with a distinct habit, as *Stenolobium*, D. Don, undoubtedly is, some species have villose, others glabrous anthers. I have never seen a specimen of *Craterotecoma*, but judging from a brief description, that genus is either identical with or very near to *Stenolobium*.

Stenolobium, D. Don.—*Char. Gen. Calyx* regularis, 5-costatus, 5-dentatus. *Corolla* infundibuliformis, 5-lobus, lobis subregularibus, rotundatis. *Genitalia* inclusa. *Stamina* 4, didynama, cum rudimento quinti. *Antheræ* discretæ, glabræ v. villosæ. *Capsula* linearis, compressa, siliquæformis, bivalvis, septo valvis contrario. *Stigma* bilamellatum. *Semina* alata, 1-seriata.—Frutices *stantes* Americæ tropicæ, *fraxinifolii*, foliis *imparipinnatis, vel unifoliolatis*, foliolis *serratis vel incisis*; floribus *terminalibus, racemosis vel paniculatis, flavis*. Species tria:—

Antheræ glabræ . . . . *S. sambucifolium.*
Antheræ villosæ :—
Foliola ovato-oblonga, subtus villosa v. tomentosa . . *S. molle.*
Foliola lanceolata, subtus sparse pilosa . . . . . . *S. stans.*

1. STENOLOBIUM *stans;* fruticosa, glabra, ramulis teretiusculis; foliis oppositis, uni- vel trifoliolatis vel pinnatis, 2–4-jugis cum impari; foliolis subsessilibus, lanceolatis, acuminatis, profunde serratis vel incisis, supra glabris, subtus versus costam nervisque sparse pilosis demum glabris; racemis terminalibus simplicibus vel paniculatis; calyce campanulato 5-nervio, nervis vix conspicuis in dentes 5 acutos desinentibus; corollâ infundibuliformi (flavâ), lobis rotundatis, extus glabra, intus versus basin villosiuscula, filamentis basi glanduloso-pubescentibus, antheris villosis, stylo ovarioque glabro, capsula (6 unc. long., 3 lin. lat.) glabra (v. v. sp. et cult.).

Stenolobium stans, *Seem. mss.*
Tecoma stans, *Juss. Gen. p.* 139; *Hook. Bot. Mag. t.* 3191; *De Cand. Prod.* ix. *p.* 224 (*excl. var.* γ).
Tecoma Gaudichaudi, *De Cand. Prod.* ix. *p.* 223.
Bignonia stans, *Linn. Spec.* 871.
Bignonia fraxinea, *Desf. Cat. Hort. Par. ed.* 3, *p.* 398?; *De Cand. Prod.* ix. *p.* 167.
Bignonia castaneæfolia, *De Cand. Prod.* ix. *p.* 145.
Bignonia serrata, *Pavon, mss.* (*fide Don*).
Stenolobium castaneæfolium, *D. Don, in Edinb. Phil. Journ.* 1823, *art. n.* 18, *p.* 263; *G. Don, Gen. Syst.* iv. *p.* 228.
Delostoma Stenolobium, *Steud. Nom. Bot. p.* 263.
Tecoma incisa, *Sweet, Hort. Brit.* (*ed.* 1) *p.* 284.

Var. *α, castaneæfolium;* foliis plerumque unifoliolatis (v. s. sp.).
Stenolobium stans, *var.* castaneæfolium, *Seem. mss.*
Tecoma Gaudichaudi, *De Cand. Prod.* ix. *p.* 223.
Bignonia castaneæfolia, *De Cand. Prod.* ix. *p.* 145.
Bignonia serrata, *Pavon, mss.* (*fide Don.*)
Stenolobium castaneæfolium, *D. Don, in Edinb. Phil. Journ.* 1823, *art. n.* 18, *p.* 263; *G. Don, Gen. Syst.* iv. *p.* 228.
Delostoma Stenolobium, *Steud. Nom. Bot. p.* 263.

GEOG. DISTR. Island of Puna, near Guayaquil, Ecuador (*Hinds! Sinclair!*), Cerro de Santana, Guayaquil (*Jameson!*), at Guayaquil (*Ruiz!*, *Gaudichaud! Pavon.*)

Var. *β*, *pinnata*; foliis plerumque imparipinnatis, foliolis serratis (v. v. sp.).

Stenolobium stans, *var.* pinnata, *Seem*, *mss.*

Tecoma stans, *Juss. Gen. p.* 139; *Hook. Bot. Mag. t.* 3191; *De Cand. Prod.* ix. *p.* 224, var. *α*; *Seem. Bot. Herald*, *p.* 180, 326.

Bignonia stans, *Linn. Spec.* 871.

Nomina vernacula: in Tucuman, teste Tweedie, *Pita Cornuta*; in Panama, teste Seem. (Bot. Herald, p. 180), *Copete.*

Geog. Distr. Jamaica (*Macfadyen! Purdie! Distan! R. Shakspear!*), St. Domingo (*C. Ehrenberg!*), St. Thomas (*Ehrenberg!*), Guadeloupe (*Duchassaing!*), St. Vincent (*Anderson!*), Santa Cruz (*Hornemann!*), Trinidad (*Lockhart, teste De Cand.*), Martinique (*Plée, Sieb.!* 165, *teste De Cand.*), Carib Islands (*Smeathman! De Ponthieu!*), Santa Cruz (*Ledru, teste De Cand.*), Barbadoes (*Mayc., teste De Cand.*), Cartagena (*Billberg!*), Vera Cruz to Orizaba (*F. Müller! n.* 1109 *et* 1110), near Santa Lucia, in the Tierra Caliente, Mexico (*Seemann! n.* 2116), Papantla (*Schiede, n.* 1206), Acapulco (*Sinclair! Lay and Collie!*), Mexico (*Gregg! n.* 315, *Berlandier! n.* 876), Panama (*Seemann! n.* 558, *Cuming! n.* 1096), New Granada, (*Herb. Hook.!*), Venezuela (*Fendler, n.* 779), Tucuman (*Tweedie, n.* 1215), Colollar, New Andalusia (*Humboldt and Bonpland! in Herb. Willd. sub n.* 11470), Altos de Toledo, Peru (*Herb. Berol.*). Naturalized in the East Indies, viz. at Bombay (*Herb. Hook.*) and at Dharwar (*Hohenacker, n.* 784). Cultivated in Europe.

Var. *γ*, *apiifolium*; foliis plerumque imparipinnatis, foliolis incisis fere pinnatifidis (v. s. sp.).

Stenolobium stans, *var.* apiifolium, *Seem. mss.*

Tecoma stans, *var.* apiifolia, *De Cand. Prod.* ix. *p.* 224.

Tecoma incisa, *Sweet, Hort. Brit. p.* 284 (*ed.* 1).

Bignonia incisa, *Hortul.*

Geog. Distr. Trinidad (*Schach! in Herb. Hook.*), Guadeloupe (*Bert. teste De Cand.*), Mexico (*Herb. Par.!*).

I have ventured to unite *T. Gaudichaudii* with *T. stans* under the above name, there being no specific distinction between them, some of the specimens I gathered in Mexico having on the same branch both unifoliate and more compound leaves. *T. Gaudichaudi* is therefore scarcely a variety, but rather a mere form. Don's *Stenolobium castaneæfolium* (*Bignonia castaneæfolia*, De Cand.) is also identical with *S.*

stans. De Candolle, who saw Pavon's specimens, upon which Don founded his species, says that they are glabrous below, notwithstanding Don's assertion to the contrary; the colour of the flowers Don stated to be purple, but he merely guessed that from very old dried specimens.

2. STENOLOBIUM *sambucifolium;* fruticosa, ramulis compressiusculis glabris; foliis oppositis, simplicibus trifoliolatis vel pinnatis, 2–4-jugis cum impari, petiolo communi ad insertionem foliolorum puberulo, foliolis breviter petiolulatis ellipticis vel oblongis acuminatis serratis basi cuneatis utrinque glaberrimis; racemis terminalibus, simplicibus vel paniculatis, multifloris; calyce campanulato, glabro, 5-nervio, nervis subcostatis in dentes 5 acutos desinentibus; corollâ infundibuliformi (flava), lobis obtusis (albidis) ciliatis, extus glabra, intus versus basin glanduloso-puberula, filamentis basi glanduloso-villosis, antheris glabris, ovario styloque glabris, capsula (9 poll. long., 2–3 lin. lat.) glabra (v. s. sp.).

Stenolobium sambucifolium, *Seem. mss.*

Tecoma sambucifolia, *H. B. K. Nov. Gen.* iii. *p.* 143; *De Cand. Prod.* ix. *p.* 224.

Bignonia Guarume, *Domb. Herb.*

Tecoma? Guarume?, *De Cand. Prod.* ix. *p.* 224, *excl. syl. Pavon.*

GEOG. DISTR. Montan, Peru (*Humboldt and Bonpland!, Dombey! in Herb. Paris.*), Valley of Canta (*Cruikshanks! in Herb. Hook.*), Quebradas of Vale of Tarma (*Matthews! n.* 672), Peru (*W. Lobb! n.* 94).

Closely allied to *S. stans*, from which it is at once distinguished by its *glabrous anthers*, and the white lobes of its corolla. It is besides a more compact and handsome species than *S. stans*, and has not been met with in localities where *S. stans* grows. Since publishing my paper on *Tecomaria*, I have seen the authentic specimens of Dombey's *Bignonia Guarume* in the Paris Herbarium, and think them identical with *S. sambucifolium;* but Pavon's *Bignonia alata*, with which De Candolle unites it, is certainly *Tecomaria* ~~*flava*~~ [fulva], judging from authentic specimens at Berlin.

3. STENOLOBIUM *molle;* fruticosa, ramulis teretibus paniculisque molliter pubescenti-tomentosis demum glabratis; foliis oppositis, simplicibus trifoliolatis vel pinnatis, 2–4-jugis cum impari, foliolis ovato-oblongis vel oblongis acuminatis grosse serratis, basi cuneatis vel rotundatis, supra puberulis mox glabratis, subtus dense villosis vel tomentosis, paniculis terminalibus multifloris; calyce campanulato, villoso, 5-nervio,

nervis subcostatis in dentes 5 acutos desinentibus; corolla infundibuliformi (flava), lobis obtusis, extus glabra, intus versus basin glanduloso-villosa, filamentis basi glanduloso-pubescentibus, antheris villosis, ovario styloque glabris, capsula (9 poll. long., 3–4 lin. lat.) glabra (v. s. sp.).

Stenolobium molle, *Seem. mss.*

Tecoma mollis, *H. B. K. Nov. Gen.* iii. *p.* 144; *De Cand. Prod.* ix. *p.* 224.

Tecoma sorbifolia, *H. B. K. Nov. Gen.* iii. *p.* 144; *De Cand. Prod.* ix. *p.* 225.

Tecoma stans, *var.* velutina, *De Cand. Prod.* ix. *p.* 224.

Tecoma diversifolia, *Mathews, mss. in Herb. Hook.*

Bignonia tecomoides, *De Cand. Prod.* ix. *p.* 166.

Bignonia juglandifolia, *Willd. Herb. n.* 11469.

Geog. Distr. Peru and Chile (*Ruiz! in Herb. Berol.*), Quitenian Andes, from 6000 to 7500 feet (*Jameson! Humboldt and Bonpland! in Herb. Willd.*), Chachapoyas, Peru (*Mathews! n.* 3172, *Gay!*), Tarma and Huanuco (*Ruiz!*), Bolivia (*Pentland!*), Buenavista, N. Granada (*Houlton! n.* 603, *Goudot!*), Antioquia (*Jervise!*), Columbia (*W. Lobb! n.* 96), Guatemala (*Skinner! in Herb. Lindl.*), Leon (*Hartweg! sine num.*), Chalco (*Andrieux! n.* 224), Oaxaca at 7000 feet (*Galeotti! n.* 1021), Mexico (*Bates! Tate!*). Cultivated in the Botanic Garden, Sydney, N. S. Wales.

Being unable to discover any specific distinction between *Tecoma sorbifolia* and *T. mollis*, I have been compelled to unite them. The hairy covering of the under side of the leaflets is more or less dense, apparently according to the elevation and locality in which the specimens have grown. This species is confined to the higher mountains, never occurring on the coast, where its place seems to be taken by *S. stans*, and it has not been found in the Isthmus of Panama, where there are no high mountains, though it has an extensive geographical range north and south of that country. It is the most robust, and perhaps the finest species of the genus, some of the leaflets measuring 5 inches in length and 1½ in breadth, though generally they are not so large.

NOTE ON FLORÆ SARNICÆ.

I had the pleasure of finding, in the month of June last, the pretty little Orchis *Spiranthes æstivalis*, Rich., in Guernsey, at an unpublished locality, under the guidance of Mr. G. Wolsey, who discovered the *Isoëtes Hystrix*, Dur. in that island. It grows rather plentifully in the swamp at the Grande Mare, in company with *Cyperus longus*, L., *Pyrola rotundifolia*, L., and *Osmunda regalis*, L. I searched Perelle Bay the same day for *Euphorbia Peplis*, L., as Mr. Wolsey said that he had gathered a plant of it there in the season of 1861, but without success. L'Ancresse Common yielded us *Isoëtes Hystrix*, Dur., *Ononis reclinata*, L., and *Arthrolobium ebracteatum*, De Cand.; the latter two very sparingly. The only other plant of interest which I found in Guernsey was *Allium Ampeloprasum*, L., at the station near the Artillery Barracks, recorded in Professor Babington's Flora. The head-bulbs are present in the only specimen I have preserved, and are equal in size to those in a specimen of *Allium Babingtonii*, Borr., which I have from the garden of the lamented Mr. W. Borrer. I have placed some of the roots which I brought away, under cultivation in our Botanical Gardens here, and next year will perhaps show to what extent the head-bulbs may be regarded as a diagnostic between these two critical species.

F. A. Hanbury.

Queens' College, Cambridge.

CORRESPONDENCE.

On Tecophileaceæ, a new Natural Order of Monocotyledonous Plants.

Hammersmith, 28*th Feb.*, 1863.

Sir,—Allow me to state my reasons for objecting to the new Natural Order (*Tecophileaceæ*) proposed in your Journal (p. 9) by Dr. Leybold of Santiago. The type of the proposed Order is the *Tecophilea violæflora*, a plant with which I am extremely well acquainted, being found at Concon, where forty years ago I made drawings and analyses from the living plant. It was first mentioned by me in 1825, in my 'Travels in Chile,' under the name of *Distrepta vaginata*; and when in England in that year I showed these drawings to the late Mr. Robert Brown, Dr. Lindley, and other botanists. Bertero collected it at the same place a few years afterwards, and gave a detailed description of it to Colla,

who published it in 1835 in the Transactions of the Turin Academy, under the name of *Tecophilea* proposed by Bertero, in compliment to Colla's daughter Tecophila, who made the drawing of it. Pöppig, who also collected the plant at Concon, unaware of these circumstances, described it in 1838, in his 'Nova Genera et Species,' as *Phyganthus vernus*, adding a drawing and analysis of it, incorrect in all its most essential details. Dr. Leybold has now furnished another generic diagnosis, or rather an ordinal one, founded on the characters of the typical plant, but in this, as well as in his drawing of the same, which you forwarded to me, and in that in possession of the Linnean Society, there are several deficiencies, which at a future time I will point out.

Dr. Leybold considers the plant as being nearly allied to *Iridaceæ*, agreeing with that family in its partially inferior ovary, its perigonium, and its rhizoma, but differing in the number, introrse direction, and mode of dehiscence of its anthers. Colla was equally wrong in considering it as belonging to the *Narcisseæ*, and Pöppig was not less so in placing it in *Hæmodoraceæ*. Endlicher, alike erroneous in his views, arranged it after *Crocus* in *Iridaceæ*; and Walpers, though nearer the mark, was wrong in placing it in the *Allieæ*, from which it differs in its mode of inflorescence. Except the latter, all the preceding botanists have founded the notions of the affinity of *Tecophilea* on the circumstance of its partially inferior ovary; but if they had examined *Cumingia*, *Conanthera*, and *Pasithaë*, they would have observed a similar occurrence, though less in degree, the latter having its capsule inferior for one-third, the former for one-eighth of its length; and they would have observed many other closely analogous points of structure. The true test of the affinity of *Tecophilea* may, however, be traced in a plant which I have lately examined, from a region of Lower Peru, bordering on Chile, which appears to agree with the genus *Zephyra* of Don, from the same locality: this has a bulbous root, vaginant leaves, and a general habit quite in accordance with *Tecophilea*; it has a corolla of similar shape, with a border of 6 lobes, 3 of which are more exterior and mucronated at the apex, 6 stamens similarly situated, but 4 of them are fertile and 2 only sterile, which are collaterally placed below the superior lobes, and which have the peculiar shape and colour of those of *Tecophilea*, and completely the form of the anthers of *Conanthera*; the fertile anthers have a similar, though shorter, basal spur-like prolongation, and present the same peculiar operculiform mode of dehiscence as in *Tecophilea*, which has not yet been properly described; the style and stigma are also alike in both cases. In all these essential respects there is the closest resemblance between the two genera, the only difference being that the ovary and capsule are quite superior, in which respect *Zephyra* resembles *Pasithaë*, and approaches *Conanthera* and *Cumingia*. There can, therefore, be no doubt as to the intimate affinity of *Tecophilea* with these genera.

Don first suggested the idea of placing *Zephyra*, *Cumingia*, *Conanthera*, and *Pasithaë*, as a distinct group of the *Liliaceæ*, under the name of *Conanthereæ*—a proposition adopted by Endlicher, who added *Echeandia*. To the same group must now be added *Tecophilea* and *Cyanella*; in all, the ovary is wholly or partially superior, but they differ extremely from one another in the form

and mode of dehiscence of the anthers. It is therefore doubtful whether they possess sufficient general characters to form a valid tribe, ranking among the *Asphodeleæ*: they should certainly either follow as a separate group, or form part of the *Hyacintheæ*. At all events, they possess no claims to rank as a distinct natural family, and therefore the *Tecophileaceæ* of Dr. Leybold cannot be maintained.

I may here remark that the carpellary characters of *Zephyra* have been hitherto unknown; in *Tecophilea* the three salient angles of its capsule are carinated, while in *Zephyra* these angles are expanded into three semiorbicular compressed lobes. Many other particulars might be stated, showing the analogy that exists between all the genera above named, but these I will reserve for a more general account, in which full analyses of the structure of *Tecophilea*, *Zephyra*, *Conanthera*, *Cumingia*, and *Pasithaë* will be figured, as well as a drawing of the new species *Zephyra amœna*. By these it will be seen that there is no tangible character that can separate *Cumingia* generically from *Conanthera*; they are identical in structure in all essential respects; the only difference is that the tube of the perigonium is less deeply cleft in the former,—a circumstance which does not afford sufficient ground for a distinct genus. I am, etc.,

JOHN MIERS, F.R.S., F.L.S.

Popular Names of British Plants.

48, York Terrace, London, N.W.

SIR,—If such inquiries are not inconsistent with the object of your Journal, will you allow me to ask your readers the meaning and origin of the following popular names of British plants? It is not the Anglo-Saxon translation of any of them that I desire, but the reason of the plants being so called.

R. C. A. PRIOR, F.L.S.

Avens.
Bennet, as applied to Hemlock.
Charlock, Carlock, Callock, Skellock.
Chedlock, Kedlock, Chadlock.
Cheet.
Christopher, as applied to Actæa, Osmunda, and Pulicaria.
Cowslip.
Daffadowndilly.
Darnel, some better explanation of it than in Wedgwood.
Dock.
Fat Hen.
Hardock.
Hare's Beard.
Haymaids or Hedgemaids.
Hindheal.
Hollyhock.
Honeysuckle.
Hurrburr.
London Pride.
Love-lies-bleeding.
Maple.
March.
Mazzard.
Mercury's Moist Blood.
Nancy Pretty.
None-so-Pretty.
Paigle.
Prattling Parnel.
Rampe.
Raspberry.
Seggrum.
Tentwort.
Wake-Robin.

[Honeysuckle: when applied to the Meadow Trefoil, is supposed to be so called because children are fond of sucking the sweet nectar from its flowers, but this does not apply to the Woodbine. In the 'Promptorium Parvulorum' it is translated *apiago*, bee-root. London Pride is said to be so called because London is proud of almost the only flower (*Saxifraga*) that grows to perfection even in the most crowded parts of the town, as we have a Mountain Pride (*Spathelia simplex*), a Pride of Barbadoes (*Poinciana pulcherrima*), a Pride of India (*Melia Azederach*), and a Pride of the Forest, one of the names by which *Sequoia Wellingtonia* is known in California; but the name was originally given to a flower that will not grow in London, a Speckled Sweet William. See Parkinson's 'Paradisus,' p. 320.—EDITOR.]

NEW PUBLICATIONS.

Index Filicum: an Illustrated Synopsis, with Characters of the Genera, and an Enumeration of the Species of Ferns, with Synonyms, References, etc. etc. By Thomas Moore, F.L.S., etc. Pamplin.

This work is rapidly approaching its conclusion, and has now reached the twentieth part, which embraces the genera *Gleichenia* and *Goniophlebium*, besides plates illustrating *Dennstædtia*, *Deparia*, *Cionidium*, *Peranema*, *Diacalpe*, *Woodsia*, *Hypoderris*, *Thyrsopteris*, *Cyathea*, and *Hemitelia*. The author has now enumerated 73 genera and 1738 species of Ferns, and, when the whole work is completed, it will rank amongst the most useful ever offered to the working systematic botanist.

A Comparative List of British Plants. By A. G. More, F.L.S. Pamplin. London, 1863.

This list, which is reprinted from the pages of the 'Phytologist,' will be of use to many British botanists. The difference that exists between our leading authorities concerning the names and specific claims of our native plants causes a catalogue, in which the names used in Babington's 'Manual,' the 'London Catalogue,' Hooker and Arnott's 'British Flora,' and Bentham's 'Handbook,' are arranged in parallel columns, very convenient. We think that Mr. Pamplin will find by its sale that he has done wisely in issuing it in a separate form. It is in octavo, and consists of thirty-eight closely and neatly printed pages.

BOTANICAL NEWS.

Professor Babington, of Cambridge, is collecting the materials for a thorough revision of the Flora of Iceland. He will be greatly obliged to any botanists who may possess information concerning the plants really gathered there, if they will communicate with him on the subject.

At the last meeting of the Royal Society of Edinburgh, on presenting the Neill Medal to Dr. Greville, Sir David Brewster said :—

"Although Dr. Neill was a member of this Society, he never took an active part in its proceedings, and I believe never communicated any paper to its Transactions. He was one of the founders of the Wernerian Society, and discharged the duties of its secretary during the thirty years of its existence under the able presidency of Professor Jameson. The Wernerian Society was, indeed, the rival of the Royal Society of Edinburgh, and its seven volumes of Transactions contain many papers by distinguished writers which would otherwise have been communicated to this Society. Dr. Neill's first publication appeared in 1806, and was entitled 'A Tour through some of the Islands of Orkney and Shetland.' In 1829 he published his 'Horticultural Tour in Flanders,' and in 1845 his 'Fruit, Flower, and Kitchen Garden,' which was a republication of the article 'Horticulture' in the 'Edinburgh Encyclopædia.' Dr. Neill communicated only two papers to the Wernerian Transactions, one entitled 'A List of Fishes in the Forth and Lakes and Rivers near Edinburgh,' and another 'On the Fossil Remains of the Beaver in Perthshire and Berwickshire.' Dr. Neill died in 1850, and bequeathed to the Royal Society of Edinburgh the sum of £500, 'the interest of which was to be applied in furnishing a medal every second or third year to any distinguished Scottish naturalist, to be adjudicated by the Council of the Society.' In fulfilling this trust, the Council wisely adopted the triennial in place of the biennial period, and the first adjudication of the prize was made to Dr. Lauder Lindsay for his researches on the structure of Lichens. The second adjudication was made to Dr. Robert Kaye Greville 'for his contributions to Scottish natural history, more especially in the department of cryptogamic botany, including his recent papers on *Diatomaceæ*.' Dr. Greville's contributions to natural history have been both numerous and valuable, and their merits have been recognized by the most distinguished botanists of the age. His 'Scottish Cryptogamic Flora' was published between 1823 and 1829. His 'Flora Edinensis' appeared in 1824. His 'Algæ Britannicæ; or, Description of Marine and other Inarticuled Plants in Britain belonging to the Order Algæ,' was published in 1830; and he has inserted in the 'Microscopical Journal' no fewer than twelve papers on the *Diatomaceæ*, an interesting subject, which still occupies his attention. But Dr. Greville's services to science have not been limited by his writings. He has been an ardent collector of plants and other objects of natural history. In 1824 the University of Glasgow conferred upon Dr. Greville the degree of Doctor of Laws; and many of the natural history societies in Europe and America have received him among their corresponding or honorary members."

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ON *GLADIOLUS ILLYRICUS*, AS A BRITISH PLANT.*

By Charles C. Babington, M.A., F.R.S., F.L.S.

(Plate IV.)

A plate will be found in the present number of this Journal representing the *Gladiolus Illyricus*, Koch, a recent addition to the British Flora. It was discovered by the Rev. W. H. Lucas, in the New Forest, Hampshire, in the year 1856, flowering in July, and is abundant in several parts of the Forest, but may be easily overlooked from being hidden in a dense growth of *Pteris aquilina.* The late Mr. Borrer said, in a letter to me, that the two situations in which he had seen an abundance of the plant extending over considerable tracts, are "such, that I should suppose no one could suspect that the plant is other than indigenous, as truly as its companion *Habenaria bifolia.*" Nevertheless, it is so suspected by persons who have not seen it, and who, therefore, only judge from what they consider probable. Mr. Borrer examined for himself on the spot with his usual care, and his opinion is stated above. At his desire I inserted a notice of its discovery in the 'Annals of Natural History,' of August, 1857 (2nd ser. vol. xx. p. 815), but with the erroneous name of *G. imbricatus.*

In the 'Linnean Journal' (vi. 177), Mr. A. G. More gave an account of the discovery of the same plant in the Isle of Wight. Unfortunately, he does not know of more than one specimen being found there, "in the midst of a wild tract of copse and heath, called the Apse or America woods." It was observed there by Mrs. Phillipps, in bud, on July 7, 1855, dug up, planted in a pot, flowered, and a drawing made of it by her. I have been favoured with a sight of the preserved specimen and its portrait, and have no doubt that the plants of the Island and of the Forest belong to the same species.

Much correspondence took place about its correct name, and claims to be accepted as indigenous. It was at first thought to be *G. imbricatus;* but a very careful examination of English and Continental specimens, and also of the writings of the best authors who have described these rather difficult plants, has led Mr. More and myself to the decided opinion that it is *G. Illyricus* (Koch). Those botanists

* In our next number will be found an additional article on this interesting plant, from the pen of J. T. Boswell Syme, Esq., F.L.S.—Ed.

who look especially to the reduction of species to a minimum, include it under the name of *G. communis;* but I cannot think that by combining into one supposed species well-marked and apparently constant forms, they are really advancing science. I once said, and still fully believe, that the most certain way of causing oblivion to fall upon a plant is to place it as a variety under some recognized species.

The specific character of our plant may be stated as follows:—*G. Illyricus*, Koch; corm clothed with nearly parallel fibres, netted above so as to leave long narrow openings; flowers secund; filaments longer than the anthers; tube of corolla nearly twice as long as the germen; capsule oval, emarginate, with three rounded angles. [It will probably be found that an excellent character resides in the *shape* of the corm, which in *G. Illyricus* seems to be ovate-acuminate, in *G. communis* globose and depressed at the top. But one requires more specimens to establish this point satisfactorily.—Ed.]

It is figured in Sturm's 'Deutschland's Flora,' fasc. 83, t. 3, in a very satisfactory manner. The fresh capsules of our plant require examination, as their form is not quite satisfactorily determined.

It is unnecessary to occupy much more space in this Journal, for Mr. More has stated all that is necessary in the 'Linnean Journal,' which we have already quoted. The plant seems to have arrived at its extreme northern limit in Hampshire. It extends up the western side of Europe, becoming less and less abundant as it attains a more and more northern latitude. It is stated to be very rare in the Departments of the Loire Inférieure and Morbihan of Western France. (See Lloyd, 'Flore de l'Ouest,' p. 450.)

I have no knowledge of this as a cultivated plant, and, indeed, had it been found in gardens, it could hardly have travelled from them to the parts of the New Forest where it grows; or, if that be barely possible, the event must be very far distant for the *Gladiolus* to have had time to spread over a great extent of wild, uncultivated ground.

Explanation of Plate IV.

Gladiolus Illyricus, Koch, (drawn from specimens kindly communicated by J. T. Boswell Syme, Esq.)—Fig. 1. Part of the netted fibre of the corm. 2 and 3. Stamens, the latter showing the entire length of the filament. 4. Stigma. 5. Ovary far advanced:—all slightly magnified.

WAS THE COCOA-NUT KNOWN TO THE ANCIENT EGYPTIANS?

By Berthold Seemann, Ph.D., F.L.S., F.R.G.S.

Mr. C. W. Goodwin, the learned Egyptologist, has raised a question of considerable interest to botanists by inserting in No. 17 of 'The Parthenon' the following communication:—

"The cocoa-nut palm is not now found in Egypt, nor do the ancient writers mention it as among the products of that country. It is well known to be exceedingly abundant in most tropical regions near the sea, and it occurs on the Arabian coasts. The origin of the name is involved in obscurity, but it has been thought to be derived from the Portuguese word *macoco* or *macaco*, a monkey, the end of the nut having three black scars, which give it somewhat the resemblance of a monkey's face. I think it may be shown that this fruit was known in very early times in Egypt, and that the name is derived from a word in the old language of that country. In the collection of 'Egyptian Monuments,' just published by Dr. Brugsch, there is an inscription (pl. xxxvi.) from the tomb of a functionary who lived in the reign of Tothmes I., *circa* B.C. 1650. It gives a list of the trees which grew in the garden of this person, with the numbers of each kind. Twenty species of trees are mentioned. There were ninety sycamores, thirty-one perseas, five fig-trees, three acacias, twelve vines, eight willows, ten tamarisks, and others which cannot be clearly identified. Appended to the name of each tree is a determinative hieroglyphic representing a bush or tree. In three cases the determinative is a manifest palm-tree. In the first of these cases the name is represented by a single hieroglyphic, a bunch of dates, of which the sound is known (from being phonetically written in other texts) to be *baner*. It is the Coptic *benne*, the date-palm (*Phœnix dactylifera*). The number of trees of this kind in the garden was a hundred and seventy. In the next case the name is written phonetically *mama*. This was, in all probability, the doum-palm (*Hyphæne cucifera*), which is common in Egypt. There were a hundred and twenty of these trees. Of the third palm, our horticulturist had only a single specimen. Its name is written phonetically *mama-en-khanent*. M. Brugsch calls it ***Hyphæne Argun***, which is the name of an African species of palm. I believe it to have been the cocoa-nut tree, for the reasons which follow. In the first Sallier Papyrus, page 8, there is a sort of poetical apostrophe to the god Thoth, the patron of scribes. In this the writer addresses his deity thus:—'O thou palm-tree (*mama*) of sixty cubits in height, upon which are *kuku* (with determinative of seed or fruit); with *khanini* (same determinative) within the *kuku*; with water within the *khanini*.' Here it is evident that the palm-tree mentioned is the same as that in M. Brugsch's inscription — viz. the palm of *khanent* or *khanini*. The *kuku* is evidently its fruit; the *khanini* must be the kernel or flesh, within which is the well-known cocoa-nut milk. The height of the tree answers well, as the ordinary growth of the cocoa-nut palm is stated to be

from sixty to ninety feet. The doum-palm is described by Pliny (xiii. 18) under the name of Cuci (*kuki*, κουκι), which is in effect the same word as *kuku*. But the fruit of the doum-palm differs from the cocoa-nut in having no juice inside it. In Coptic, κουκε means bark; and perhaps this word may have been applied to the nuts of both palms, from the barky husk with which they are surrounded. The Copts had also the Grecized word κουκουναρια for fir-cones. Perhaps the Greek κοκκος may be radically the same word, though the Greeks only applied it to much smaller fruits, or berries. We need not, then, go to the Portuguese for the derivation of Cocoa, seeing that the identical name was applied to palm-nuts by the Egyptians in the fourteenth century B.C., the date of the Sallier papyrus. That the cocoa-nut was a rarity in Egypt we may see from there being but one tree of the kind in the old gardener's collection, while he had above a hundred each of the native palms. For this reason also, as well as for the peculiar and refreshing character of its fruit, it appeared to the poetical scribe a worthy symbol of his patron deity."

This communication suggested to me the following remarks ('Parthenon,' No. 34):—

"The cocoa-nut is now found in every part of the tropics, though never beyond them, chiefly on the sea-coast; some varieties, however, have been met with far inland, for instance, at Merida, in Yucatan, by Heller; at Patna, in Bengal, by J. Hooker; and at Concepcion del Pao, in South America, by Humboldt and Bonpland. But there is reason to believe that at one time its geographical range was much more limited; indeed, we know that even in our days it has been extended to the West Coast of Africa; and the great puzzle has been, whence did it originally spring? Though having paid considerable attention to this subject, I am not acquainted with any theory, nor have been able to start one myself, which would be in unison with the part the cocoa-nut at present plays in different countries. It is generally assumed that the Isthmus of Panama, or the country thereabouts, was the cradle of this singular production, and that it thence floated to Polynesia and Asia. The reason for this assumption is that all the other species of the genus *Cocos* belong to the New World as inland species, and that it is reasonable to suppose this littoral one (*Cocos nucifera*) also endemic to America. But it should not be forgotten that there are several genera of palms with representatives about the native country of which there is no doubt, in both hemispheres: for instance, the oil palms (*Elaëis*) in Africa and America, and the common fan palms (*Chamærops*) in Europe, Asia, and America. Moreover, every traveller must have observed that whilst the Asiatics and Polynesians have discovered innumerable

uses of the cocoa-nut tree, the American natives have made no such progress, and consume the fruit as an occasional luxury only. This would seem to imply that the acquaintance of the latter with the tree dates from a comparatively recent period, whilst that of the former from a more remote one, and that America can scarcely be regarded as its native country.

"On turning to Polynesia we find whole islands covered with cocoa-nut, and in some groups the entire population relying upon it as their staff of life. It has all the appearance of being perfectly at home, but there is one circumstance that strikes us as very curious. The Polynesians are supposed to be of a Malay stock, and to have migrated somewhere from Eastern Asia. How comes it that they are ignorant of the art of preparing toddy from the unexpanded flower-branches of the cocoa-nut palm,—a beverage of so ancient a date that the oldest language of Asia has a term for it, toddy being a corruption of the Sanskrit word *tade?* Did the Polynesians leave the cradle of their race before the cocoa-nut had found its way to it? or are we to assume that the Polynesians have migrated with the trade-wind rather than against it; that Malayan Asia was peopled rather from Polynesia than Polynesia from Malayan Asia? Toddy may be extracted from other palms besides the cocoa-nut, and has been obtained from several indigenous Asiatic palms (*Caryota*, *Arenga*, etc.) from time immemorial. Had the Polynesians therefore once known the process, they would probably never have forgotten so easy a way of obtaining sugar, vinegar, yeast, and a pleasant drink, the strength of which may be regulated by time to any man's taste. So either the Polynesians could never have come from Eastern Asia, or else, after spreading over the South Sea, ages must have elapsed before the cocoa-nut made its appearance in those waters, so that the process of toddy-making (there being no other suitable Polynesian palms to operate upon) had been entirely forgotten, and even disappeared from native traditions. Under such circumstances, it behoves us to suspend our final judgment whether Polynesia be or be not the native country of the cocoa-nut.

"As already stated, Western Africa has in our times only become familiar with the *Cocos nucifera*, and I have not been able to learn anything regarding its history on the eastern coast of that continent, except that in Madagascar, in common with many other things supposed to have been imported by Malay pirates, it bears a *Malayan* name.

"But how about Asia, where such forests of these palms now gird the coast, and where they seem to grow with almost greater vigour than in America or Polynesia? Can that have been the cradle of the nut? There are weighty reasons for hesitating in a reply. The littoral parts of Ceylon, as every passenger by the overland mail will remember, are now densely covered with this tree, and it looks more at home there than I have ever seen it in any part of the world. Yet both tradition and history affirm that at one time the cocoa-nut was unknown in Ceylon. Not far from Point de Galle there is carved in a rock the gigantic effigy of a native prince, Kottah Rayah, to whom is ascribed the discovery of the properties of the cocoa-nut, which before his time were unknown, as was also the tree. Moreover, the oldest chronicle of Ceylon, the 'Marawansa,' the historical value of which is now fully admitted, is absolutely silent about everything relating to the cocoa-nut, whilst it never fails to record, with tedious minuteness, every accession of other fruit-trees made to the plantations by native princes. Now, is it probable that a fruit like the cocoa-nut, which is often tossed about the ocean for months without losing its germinating power from the effects of salt water,—is it probable that if such a fruit had been indigenous to any part of Asia, it should have reached Ceylon only in a comparatively recent historical period?

"These and similar puzzles having engaged my attention ever since I brought out my 'Popular History of Palms,' I was somewhat prepared for the question, 'Was the cocoa-nut known to the ancient Egyptians?' Setting aside the arguments advanced in the 'Parthenon' for an affirmative answer, I should reply—There is no reason why it should not have been cultivated at Thebes more than three thousand years ago. Some varieties of the nut will grow far inland, and Thebes is not so very far distant from the sea to preclude such a contingency: the climate would also admit of it. Again, if the cocoa-nut could be drifted in modern times by the prevailing winds and marine currents from Western America to Eastern Asia, there is no reason why it should not have done the same three thousand years ago, when the distribution of land and water must have been pretty much the same as it is now, and the direction of the winds and currents was doubtless not different from what we find in our days. It is therefore not unlikely that the cocoa-nut, if known in Asia three thousand years ago, might have found its way to Egypt,—even Solomon's fleet having

brought home curiosities of every description from Ceylon and other parts,—and might have been cultivated by a gentleman attached to horticulture. But I am not quite prepared to confirm the venture that the *Mama-en-khanent* of the catalogue of the Egyptian garden was the cocoa-nut. The determinative appended to the hieroglyphic is very rude, and all one could conscientiously say is, that in outline it looks much like either a Palm or a Musa. But in taking into consideration that the apostrophe in the Sallier Papyrus, page 8, applies to this tree, it may be granted that we have to deal with a Palm, the Musa fruit

Portion of the Temple of Edfou (Edfu).

having no water inside. But the presence of water inside the fruit would not settle the question whether we have the real cocoa-nut before us. What is popularly termed the 'water' is common to all palms when the fruit is sufficiently young, and disappears on approaching maturity. The water—to keep to the term—would probably not be noticed in *small* fruit; and the fact that it was specially alluded to

in the apostrophe would seem to imply that the author was speaking of a *large* fruit. The height of the tree mentioned in the papyrus (sixty cubits) tallies well with that usually attained by the cocoa-nut tree *in the tropics* and *near the sea;* but it may be questioned whether that palm would attain its full dimensions in a place situated like Thebes. I have seen the tree struggling for existence at the very edge of the equinoctial region, even in its favourite haunts in the neighbourhood of the sea—for instance, the Sandwich Islands and the Gulf of California. There are no other points a botanist could lay hold of, and I may therefore be permitted to guess what other palm can possibly be meant by the *Mama-en-khanent.* The palms of Egypt are the date and the doum (*Phœnix dactylifera* and *Hyphæna Thebaica*), both of which are disposed of by the writer in the 'Parthenon.' But there is a palm in Nubia, and probably also in Upper Egypt, the deleb (*Borassus? Æthiopum*), which has a fruit quite as large as some of the middle-sized kind of cocoa-nut, and the ventricose trunk of which has evidently been the prototype of the *columns* seen in Egyptian temples; the date palm, from which the capitals were copied (as is evident in the great temple of Edfou), having no such swelling in the trunk. There is a considerable quantity of water in the fruit of the deleb palm; and as its height also agrees with that mentioned in the apostrophe, the balance of evidence would rather seem in favour of this tree as that meant by the *Mama-en-khanent.* This same palm has already been mistaken for the cocoa-nut tree; it is the palm of Timbuctoo, which Humboldt, misguided by erroneous information, thought to be *Cocos nucifera,* until, in a paper read before the Linnean Society, I showed it to be *Borassus? Æthiopum.*"

GALINSOGA PARVIFLORA, *Cav.*, A NATURALIZED BRITISH PLANT.

It is some years since I observed this plant growing in great abundance in the sunken gutters of the Asparagus grounds between Richmond and Sheen. I am surprised that it has not yet been noticed in any of our Floras, as it seemed to me then completely naturalized. On mentioning the circumstance to my excellent friend the Rev. W. W. Newbould, he visited the district, and on his way found it quite as

common as Groundsel in the cultivated ground and in the hedge-banks between Kew and East Sheen. The plant was introduced from Peru into Kew Gardens in 1796, from seed sent by Menzies, as recorded in the 'Kew Garden Catalogue,' and further confirmed by specimens in the herbarium of the British Museum, which were received from the Gardens in that year. I do not find it mentioned in any of the French Floras that I have at hand; but Koch includes it in his 'Synopsis' (ed. 3, p. 309), stating that it is now very abundant in the cultivated fields of Northern Germany; Reichenbach figures it in his 'Icones Floræ Germanicæ' (xvi. t. 92); and Billot has distributed it in his valuable 'Flora Galliæ et Germaniæ' (nos. 388 and 1900), from sandy cultivated fields and waste places near Berlin.

J. E. Gray.

ON THE MORPHOLOGY AND ANATOMY OF *PHILYDRUM LANUGINOSUM*, *Br.*

The structure of the flower in this singular plant seems to be but imperfectly understood. Lindley (Veg. King. p. 186) says, "it is uncertain what the exact analogy of its petaloid divisions may be, but they appear to belong to the corolla." Robert Brown, Endlicher, and others, evade the difficulty, by speaking of the two yellow segments intervening between the bract and the fertile stamen, as forming a *perigonium diphyllum*. The examination of certain Chinese and Australian specimens, as well as of numerous specimens grown in the Oxford Botanic Garden, and kindly communicated to me by Mr. Baxter, lead me to consider the so-called *perigonium* as a calyx, the corolla not being developed, and for the following reasons. The lower or anterior segment, next to the bract, is evidently a single foliar organ, with a median and other nerves; the upper segment, on the other hand, has two strongly-marked lateral nerves, while its apex is not unfrequently emarginate or slightly cleft. Opposite to the lower segment, is the single fertile stamen, the two petaloid stamen-substitutes being placed opposite the two halves of the upper segments. Within the staminal whorl is the three-celled ovary, of which one cell is anterior or opposite to the fertile stamen, while the two others are lateral or pos-

terior, and thus opposite to the assumed sepals, a position identical with that of the same parts in the allied family *Xyridaceæ*. Hence, then, until further evidence of the affinities and structure of these singular plants affords us fuller information, we may assume that the corolla and a second row of stamens, internal to the existing one, are suppressed. Such a supposition accords with the evidence we now have, and is in perfect accordance with the due position of all the floral whorls, according to the law of alternation.

The pollen grains of *P. lanuginosum* are roundish, and cohere in little groups of four. The lower end of the stem is globular, like the corm of a Crocus. From its inferior surface proceed numerous simple root-fibres. This portion of the stem is chiefly cellular, the constituent cells being filled with large ovoid starch-grains. A cross-section of the upper portion of the stem resembles at first sight that of an Exogenous rather than an Endogenous plant. The epidermis consists of one layer of rather thick-walled, oblong cells, with here and there a stoma formed by two oblong arcuate guard cells. Subjacent to the epidermis is a thick layer of parenchyma, the constituent cells being spheroidal or ovoid and containing chlorophyll. The cells are very loosely packed, so that the intercellular passages are numerous and irregular. Within this cellular layer is a complete zone of woody or bast tissue of considerable thickness, its outer boundary being nearly parallel in direction with the surface of the stem, the inner boundary here and there projecting inwards towards the centre of the stem. Anatomically, this woody layer consists mainly of thick-walled wood cells with a very few fibro-vascular bundles interspersed here and there, especially towards the inner portion of the stem. Within this liber-like zone, is a cylinder of cellular tissue, the cells of which are spheroidal, much larger than those on the outer side of the bast zone; they contain no chlorophyll, and have very small intercellular passages. Traversing this portion of the stem are a few fibro-vascular bundles, consisting on the outer sides of wood-cells and on the inner of various forms of spiral vessels and pitted ducts. Quite in the centre of each bundle may be seen a few thin-walled long cells—cambium cells? The sheathing leaves are of a spongy texture, with numerous large intercellular spaces crossed here and there by septa of radiating or star-shaped cells.

M. T. MASTERS.

ON THE ANATOMY OF THE LEAFSTALK IN *THALIA DEALBATA.*

Some years since I drew attention to the curious appearance presented by the leafstalk of this plant, and intended to pursue the subject further, an intention only partially fulfilled. Possibly the following note may prove of service to some observer with greater opportunities of tracing the development and anatomy of the plant than myself. The leafstalk is made up of a number of long air-canals, regularly arranged somewhat in the form of a semicircle, one of their number being usually larger than the rest. Crossing these air-canals are a number of septa, made up of very beautiful star-shaped cells. Passing through the interspaces between these cells, with which they are sometimes in contact, but quite detached from the sides of the air-canals, are numerous isolated woody bundles, which, to the naked eye, resemble fine threads, so that the longitudinal section of the stem has no slight resemblance to a piece of fine canvas.

On microscopic examination the longitudinal fibres are seen to consist of wood cells, with small apparent tubercles adherent to or projecting from them; these apparent tubercles being merely small cellular masses, either irregularly developed, or, as suggested by Mr. Tuffen West, to whom I transmitted specimens, being the result of proportionately more rapid growth in the woody tissue than in the cellular, the former retaining, adherent to it, portions of the latter torn off during growth. This very plausible explanation needs the confirmation which would be afforded by a study of the anatomy and development of the plant from its earliest stages. I have only to add that neither in *Canna*, *Maranta*, *Hedychium*, nor *Strelitzia*, and other allied genera, is there anything like the peculiar structure now described.

M. T. Masters.

AUGUSTIN-PYRAMUS DE CANDOLLE.

By Asa Gray,

Professor of Botany at Cambridge, Massachusetts.

De Candolle was born at Geneva on the 4th day of February, 1778; he commenced his distinguished career as a botanist in Paris in the

later days of the French Republic; he continued it at Montpellier until 1816, when he returned to his native Geneva, where he died in September, 1851,—on the fifth day of that month, according to the opening paragraph of his son's preface to his father's autobiography,—on the twenty-fifth according to the note by the same excellent authority at the close of the volume, p. 489. We cannot account for the discrepancy; but the former is without doubt the true date. The twenty-one years which have elapsed since his death have thinned the ranks of those who knew De Candolle, either personally or by correspondence. The 'Théorie Élémentaire,' the 'Organographie,' and the 'Physiologie Végétale' have played their part, and have long ago passed out of general use. Yet, thanks to their influence, but more especially to the 'Prodromus,' the name of De Candolle is still perhaps the most prominent one with the cultivators of the science in general the world over,—is associated, not indeed with the profoundest depths, but with a larger amount of botany, than any other name, except that of Linnæus.

The family of *Decandolle* (to retain the style of orthography which is kept up at Geneva, in which the "De" is written as a substantial part of the name) is an old and noble one in Provence; and a branch of it, reaching Naples in the thirteenth century in the suite of the Anjou princes, flourished there, under a name gradually changed from Candola to Caldora, down to the middle of the sixteenth century. Augustin-Pyramus De Candolle derived one of his baptismal names from his ancestor, Pyramus de Candolle, who, becoming Protestant, fled from Provence to Geneva in the year 1591, following an uncle who had already been established there for thirty or forty years. Augustin was the name of his father, in his earlier days a Genevan banker, a member of the state council, military syndic, and, about the outbreak of the French Revolution, Premier Syndic of the little republic. Displaced by an earlier *coup d'état* as he was about to enter upon the duties of this office, he had retired into the country just in time to escape the worst perils of the woful imitation at Geneva of the Reign of Terror, in July, 1794, although he was condemned to death for contumacy, and his property in the city for a time sequestrated. The rest of his life was peaceful and long: he attained the age of eighty-four years, and died in 1820.

Augustin-Pyramus appears to have been remarkable in his boyhood rather for quickness of learning than for scholarship. His early tastes

were for *belles-lettres* and poetry. At the age of sixteen he happened to attend a few lectures of a short course on botany, given by Vaucher,—who, living to a venerable age, survived his distinguished pupil. Here he learned the names of the parts of the flower, but nothing whatever of classification, having gone into the country for the summer before that portion of the course was reached. But his curiosity was awakened; and in his leisure hours he began to collect, observe, and even to describe the plants he met with in his rambles, at first without any botanical book whatever to guide him, and without any idea beyond that of amusement or relaxation. The next winter, returning to Geneva and to his college studies, he came to know Saussure, then in his last years and half paralytic. The veteran physicist, while he endeavoured to attract the young man to scientific pursuits, discouraged his predilection for botany. That he regarded as quite unworthy of serious attention. Another summer passed upon the side of the Jura, however, and the perusal of Duhamel's 'Physique des Arbres,' of the 'Researches upon Leaves' of the Pastor Bonnet (a friend of his father), also of Hale's 'Vegetable Statics,' which he painfully translated from the English, and finally, the acquisition of the 'Linné de l'Europe' of Gilibert, in which the Linnæan artificial classification even then annoyed him by its incongruity with the natural relationships which he already recognized,—these had by this time fixed his fate before he was at all aware of it, and perhaps had even determined in some sort his characteristics as a botanist.

An unexpected opportunity to pass the ensuing winter in Paris opened the way. This occurred through an invitation from Dolomieu, who, while young De Candolle was herborizing in the Jura, had been mineralogizing in the Alps, attended by two of De Candolle's schoolmates, Picot and Pictet. In the autumn of 1796, the three young men proceeded to Paris, under the auspices of Dolomieu, who secured for De Candolle a lodging immediately over his own apartments, and presented him to Desfontaines and Deleuze at the Jardin des Plantes. No botanical lectures were given at that season of the year; but De Candolle attended the principal scientific courses then in progress; among them, those of Fourcroy and Vauquelin upon chemistry, of Portal and Cuvier upon anatomy, and of Haüy upon mineralogy. It was at this early period that his acquaintance and life-long intimacy with the excellent Delessert family commenced. By a rather ingenious

device he contrived to make the acquaintance of Lamarck, but he gained little thereby in the way of botany, Lamarck being just then wholly occupied with the discussion of chemical theories. When De Candolle returned to Geneva in the spring of 1797, Lamarck sent by his hands a volume to Senebier, and so he came to know his amiable countryman, who, in ascertaining the capital fact that plants decompose carbonic acid, may be said to have laid the foundation of modern vegetable physiology. The first genus which De Candolle established (in 1799) was *Senebiera*.

From his narrative, it would appear that during this summer of 1797, the ambitious young botanist of two years' standing, and only eighteen years old, had not only conceived the idea of writing an elementary work, but actually traced the plan and wrote some chapters of it! He even states that from this period date the first observations and the conceptions—confused indeed, but correct—of the part which the abortion and the union of organs play in floral structure,—namely, the ideas which principally distinguish the 'Théorie Elémentaire,' published fifteen years later. How far these ideas were developed, however, we have no means of ascertaining. One would like to see an extract from this early manuscript, in confirmation.

The following winter he began to study law at Geneva. But with the little State now annexed to the French Republic, the prospects were not encouraging. A career must be sought elsewhere. De Candolle determined to study medicine, at the same time prosecuting his botanical studies, so as to have a double chance, by falling back upon the former in case the latter failed to support him.

In this view, he returned to Paris in the spring of 1798, just in time to see his patron Dolomieu set out for Egypt, as one of the *savants* of that famous expedition, and to decline a pressing invitation to accompany him. Taking a lodging in the Rue Copeau, to be near the Jardin des Plantes, he attended the hospitals and medical lectures, which he disliked, but recompensed himself at the Garden of Plants with the courses of Lacépède, Lamarck, Cuvier, and Haüy, omitting the botanical lectures, as not to his mind, but sedulously examining the plants of the Garden. He renewed his acquaintance with Lamarck, at whose request he wrote a few articles (under the letter P) for the 'Dictionnaire Encyclopédique.' Lamarck himself by this time had quite abandoned botany.

It was to Desfontaines that De Candolle was indebted for an immediate opportunity of beginning his botanical career. It came about thus. L'Héritier, who appears to have been wealthy, had engaged Redouté, the celebrated flower-painter, to prepare drawings of all the fleshy plants in cultivation, it being impossible well to preserve them in the herbarium. The artist, undertaking to publish these drawings, applied to Desfontaines for a botanist to furnish the descriptive letter-press. The kind Desfontaines recommended De Candolle, and moreover offered to direct him in the work. He freely opened to the young botanist his herbarium and library, and allowed him to study by his side; indeed, Desfontaines was his botanical master and fatherly friend. The botanical library of L'Héritier, then much the largest at Paris, was naturally at his service, until the death, by assassination, soon afterwards, of its singular owner. De Candolle, thus connecting his name and studies with the work of the unrivalled flower-painter, acquired thereby, as he remarks, more reputation than he deserved, and more instruction than he expected.

In the course of this same summer of 1798, an invitation from Alexander Brongniart, the mineralogist, (whom De Candolle had slightly known, through Dolomieu, on his first visit to Paris,) connected him with a small party of naturalists who made an excursion to Fontainebleau. Besides Dejean, the entomologist, then very young, Cuvier and Duméril were of the party. In the autumn of the same year he visited Normandy, with less celebrated companions, and formed his first acquaintance with marine vegetation. The next year, he made a visit to Holland, to consult the gardens and conservatories of that country, the richest in the *plantes grasses*, which then occupied his attention. One result of this journey was, that he induced his friend Benjamin Delessert to purchase Burmann's herbarium, and thus to lay the foundation of the important collections and library at the Hôtel Delessert, which have been so useful to naturalists and so liberally devoted to their service. During the winter of the following year, De Candolle elaborated the 'Astragalogia,' his first independent work of any considerable consequence, and which was published two years later: in this he found opportunity to dedicate to his friend Delessert the Leguminous genus *Lessertia*.

About this time, namely, at the beginning of the century, he became acquainted with Mirbel, who had come up to Paris from the south of France, where he had been a pupil of Raymond.

To De Candolle's credit it must be said, not only that his career was remarkably free from controversies about priority and reclamations, but that his example and precepts, his scrupulous care to render due credit te every contributor, his respect for unpublished names communicated to his own or recorded in other herbaria, and the like, have been most influential in establishing both the law and the ethics which prevail in systematic botany (more fully or from an earlier period than in the other departments of natural history), and which have secured such general co-operation and harmonious relations among its votaries.

In these early days, De Candolle was a good deal occupied with vegetable physiology;—the results are contained in his papers "on the pores in the bark of leaves," *i. e.* stomata; on the vegetation of the mistletoe; and on his experiments relative to the influence of light on certain plants, mainly those which exhibit strikingly the change in the position of their leaves at night, which has been called the sleep of plants. The account of these experiments, in which he caused certain plants to acknowledge an artificial night and day, when read before the Institute, gave him considerable *éclat;* and probably also the compliment of being named one of the three candidates to fill the vacancy in the Academy of Sciences left by the death of L'Héritier;—a mere compliment, for the contest, of course, was between Labillardière and Beauvois. In the canvass, De Candolle called upon Adanson, then very aged, and in his dotage more eccentric than ever.

If not chosen into the Institute, which indeed he could not pretend to expect, De Candolle was in that year made a member of that active association,—"la pépinière de l'Académie des Sciences,"—the Société Philomathique, and was soon placed on the committee in charge of its "Bulletin." This brought him into intimate connection with such colleagues as Brongniart (Alex.), Duméril, Cuvier, Biot, Lacroix, and Sylvestre.

"We met, at each other's lodgings, on Saturday evenings, after the session of the Society, to read and to discuss the *morceaux* intended for the Bulletin, and when our labour was finished we took tea together and chatted familiarly. As one by one we exchanged the celibate for the married state, our wives were introduced;—then we no longer read our extracts, and at length we gave over making the Bulletin, but we kept up our Saturday evening réunions. It was in consequence of this that Cuvier continued long afterwards his Saturday evening receptions; but I return to the year 1800."

By De Candolle's account, he was by about ten years the youngest

member of this réunion. Yet he has the names of Biot and Duméril on his list, both of whom survived him for twenty years; and Biot was really not quite four years his senior, and Duméril only five. As a member of this select circle of intimate friends and zealous *savants*, all then pressing on to the very highest distinction, we may well believe that the ambitious young botanist enjoyed and improved to the full such golden opportunities, that he learnt something of every branch of natural history, and also, what was no less useful in Paris, "à connaître les hommes et les mobiles cachés de bien des choses."

An episode of fifteen days, during which De Candolle, to his great surprise, had political functions to perform,—being appointed one of the three notables of the department of the Léman, in a representation of all the departments of the French Republic, which the First Consul called together,—gives us the first glimpse of Bonaparte in this narrative; and De Candolle's account of the interviews with him and with his minister of police, Fouché, is well worth preserving. With this transient exception, we have only the most incidental allusions to public affairs during the eventful years of the Consulate, the Empire, and the Restoration.

We pass by, also, the interesting account which De Candolle gives of the doings of Delessert and himself in the establishment and administration of the Philanthropic Society, which grew out of the introduction by them of Count Rumford's economical soups, distributed to the poor. These honourable undertakings brought the two friends into relations with Rumford himself when he came to reside at Paris. Indeed Delessert, as we have had occasion to learn, became one of Count Rumford's executors. The admiration with which Rumford's writings and economical inventions had inspired the two young philanthropists was much diminished upon personal acquaintance.

Apropos to reminiscences of distinguished *savants*, we look forward a year or two in the narrative, and select the following:—

"Joseph Correa de Serra was then about fifty-five or sixty years old. He was of an ancient family in Portugal, which had produced several literary men. After studying at the University of Coimbra he was transferred to Rome, where he pursued theological studies for a dozen years at the College of the Sapienza, but which he left with a knowledge of many things besides theology. Returning to Portugal he was made Governor to the hereditary Prince, Secretary to the Academy of Sciences, etc., and became a very influential person, both on account of his talents and on account of the position of his pupil, who it

was supposed would become King on attaining his majority, as his mother was only regent. Correa was made Minister; and his first act was to overthrow the Inquisition. But the Prince died just as he was coming of age, and Correa was left exposed to the hatred and jealousy of the priests. After awhile he obtained permission to go to England, where he lived in the society of the *savants* of which Sir Joseph Banks's house was the centre. Afterwards he removed to Paris, where he also lived amongst *savants* and men of letters, and where he showed the most noble character when the seizure of Portugal by Bonaparte deprived him of all his resources. He possessed the singular faculty of knowing everything apparently without labour. It is only the people of the south who can thus combine great facility with profound idleness. The latter prevented his publishing anything beyond small dissertations, quite below his talents; but in conversation all his various knowledge and his ingenious views were charmingly exhibited. In these days Humboldt and Cuvier often came to my lodgings, where they occasionally met Correa. Although their celebrity was far above his, and justly so, on account of their published works, yet Correa always got the advantage over them; and it was by no means the least of the enjoyments of our sociable little dinners to see the sort of deference, and even fear, which Cuvier and Humboldt exhibited in the announcement of their opinions before Correa, who, with the grace and sly maliciousness of a cat, would at once expose their weak sides. Like them, he was familiar with all the historical and natural sciences, and he used his vast stores of knowledge with a severe logic and rare sagacity. He spent many hours in my herbarium; where the subtle perspicacity which he brought to bear at a glance upon plants, often wholly new to him, taught me much of the art of observing, and especially of combining observations in botany. To such talents he joined a lofty soul and a heart devoted to friendship. It was a great grief to me when, at over sixty years of age, he quitted Europe to rejoin in Brazil the king who had persecuted him; but he forgot all his wrongs when his sovereign became unfortunate. Correa died when Ambassador to the United States."

The following, of a somewhat later period, is abridged from De Candolle's account of the Société d'Arcueil:—

"Its founder was the excellent and illustrious Berthollet, who then living in his country residence at Arcueil, . . . invited thither, once a month, a few young *savants*, by way of encouraging their efforts. His colleagues MM. de la Place and Chaptal, also senators and members of the Institute, were, so to say, Vice-Presidents of this little reunion. Humboldt also had a place, and the *parterre* was composed of Biot, Thénard, Gay-Lussac, Descotils, Malus, Amédée Berthollet, and myself. Later, Bérard and François de la Roche were admitted. [And finally Arago, Poisson, and Dulong, adds the editor of De Candolle's 'Mémoires,' who notes that the last volume of the 'Mémoires d'Arcueil' was published in 1817.] The association was devoted to the physical and chemical sciences. I was admitted in view of the applications of vegetable physiology to chemistry; and I contributed some articles upon this subject to the 'Mémoires d'Arcueil,' namely, my 'Note on the Cause of the Direction of Stems towards the Light,'

my 'Memoir on the Influence of Absolute Height upon Vegetation and upon the Geographical or Topographical Distribution of Plants,' and later, one upon double flowers, especially of the *Ranunculaceæ*. The first of these writings was a simple and clear solution [although an incorrect one, as it proves.—ED.] of a problem which was deemed insoluble; the second reduced to just proportions the exaggerations of Humboldt upon the influence of elevation; the third was an essay connected with the observations of the degenerescence of organs, to which my 'Théorie Elémentaire' was devoted. . . . .

"We commonly made our rendezvous at Thénard's, and went together to Arcueil, as happy with this run into the country as school-boys out for a holiday. We walked about in this pleasant villa, and relished the society of our leaders. Nothing can fully describe the good-nature and simplicity of M. Berthollet and even of Madame. They were with us as parents with their children, and we made ourselves at home in the house with perfect *abandon*. M. Berthollet was quite fat and very full-blooded. He feared heat so much that he wore clothes only out of respect to society, and at night he slept entirely uncovered upon his bed. 'What,' said we, 'even in winter?' 'Oh,' he answered, 'when it is very cold I spread my pocket-handkerchief over my feet.' This man, so high in social rank and scientific celebrity, bore contradiction unusually well, and loved above all things truth. When the first works of Berzelius upon definite proportions became known at Paris, I was very much taken with them, and although they were in direct opposition to the principles of statical chemistry he sustained, I did not fear to tell M. Berthollet the high opinion I had of them. Far from taking offence at this preference, he encouraged me to study the writings of Berzelius.

"M. de la Place was of quite a different character. He had the dryness of a geometrician and the haughtiness of a *parvenu*. Over and above these defects of manner, he was a man of honour and worth. . . . He often seconded me, although in truth he thought very little of natural history. In our meetings he often had little quarrels with M. Berthollet, and would think to silence him by saying, 'But you see, M. Berthollet, what I say to you is mathematics.' 'Eh, par Dieu, what I say to you is physics,' answered the other, 'and that is quite as good.' . . . Humboldt also came from time to time; but he added much of life and interest when he appeared. He affected to pass himself as the creator of the science of Botanical Geography,—to which he has only added certain facts, and the exaggeration of a true theory so as to render it almost false. He never quite pardoned me for having, in the preface to my memoir 'On the Geography of the Plants of France,' cited those who before him had occupied themselves with geographical botany,—although in this exposition I had, in truth, much amplified his share.

"Among the other members of the society of whom I have not yet spoken, I would chiefly mention Thénard, who was then commencing a career which has since become very brilliant. His activity, his ardour, and his uprightness pleased me very much."

We pass over all De Candolle's account of his life and domestic

affairs during his residence at Paris, his particular investigations, his excursions in Switzerland and elsewhere,—even the memorable one in the Jura with Biot and Bonpland, in which he led the party into a position of imminent danger, causing Bonpland to bemoan his hard fate in having to perish on such a mole-hill as the Jura, after having safely climbed Chimborazo;—his engagement and marriage (the latter in April, 1802) with Mlle. Torras, of a Genevan family resident in Paris;—of the foundation of his herbarium by the fortunate acquisition of that of L'Héritier;—of the first course of lectures which he gave, at the Collége de France, as a substitute for Cuvier, during the temporary absence of the latter, giving a course of vegetable physiology in place of one on general natural history;—how he prepared to take the degree of M.D., in order to qualify himself as a candidate for the chair of medical natural history at the School of Medicine, then vacant; but how Richard, who disliked him because he was a pupil of Desfontaines, as De Candolle says, instigated Jussieu to offer himself for this chair, upon which, of course, De Candolle withdrew, but nevertheless wrote and sustained, as a thesis for the doctorate, his Essay on the Medical Properties of Plants, compared with their exterior forms and their natural classification. He bore his examination creditably, received his diploma, and the same evening, a private mock inauguration, which, considering the parties engaged in it, must have been irresistibly comical.

For the event which fixed De Candolle in his true field of labour was his arrangement (in 1802) with Lamarck, who had long since abandoned botany, to prepare a new edition of the 'Flore Française.' The arrangement was a favourable one to De Candolle, both financially and scientifically. The new edition was, of course, an entirely new work, one particularly adapted to De Candolle's genius, and which gave him at once a wide reputation. Indirectly this work gave origin to the botanical explorations of the provinces of France, under the auspices of the Government, which engaged much of De Candolle's attention from the summer of 1806 until he ceased to be a French subject.

And now, the death of old Adanson left a vacancy in the botanical section of the Institute, which De Candolle might hope to fill. But parties and personal dislikes, as it appears, were not unknown nor uninfluential in the Paris of half a century ago. Indeed, De Candolle

(let us hope without sufficient grounds) roundly charges lamentable weakness to Lamarck, and less creditable motives to Fourcroy and even to Jussieu, in respect to the nomination and canvass; while of the Abbé Haüy, he relates, to his credit, that, upon being approached with the suggestion that his conscience should prevent his voting for a Protestant, he replied that he was very glad of an opportunity to show that he never mixed up religious opinions with scientific judgments. Palisot de Beauvois, the rival candidate, was elected, in spite of the hearty support De Candolle received from his comrades of the 'Bulletin Philomathique,' and his eminent associates of the Société d'Arcueil, Berthollet, Chaptal, La Place, Cuvier, etc.,—to say nothing of his scientific superiority over his rival, which De Candolle naturally regarded as very great. At that time, according to De Candolle, Beauvois had produced "ni la 'Flore d'Oware,' ne le 'Prodrome de l'Ethéogamie,' ni en un mot aucun de ses ouvrages qui," etc. But in this De Candolle's memory was perhaps at fault; for, while this election took place in the autumn of 1806, the latter of these works of Beauvois, according to Pritzel, was published in 1805, and the first volume of the former in 1804.

Evidently the disappointment was keenly felt. Membership of the Institute secured not only an assured position, but also a comfortable little annuity. This, and the prospective needs of an increasing family, disposed De Candolle to look elsewhere, and to accept, after some hesitation, the botanical chair at the University of Montpellier, which in 1807 became vacant by the death of Broussonet. Hardly was he established there when the death of Ventenat, in the autumn of 1808, made him again a candidate for a seat in the Institute: again an unsuccessful one, but now chiefly because a considerable number of his particular friends in the Institute required a promise that if chosen he would reside in Paris, which he could not with propriety give. So they voted for Mirbel; and De Candolle took root at Montpellier, where he flourished from 1808 to the year 1816.

That De Candolle, full of ambition and with a good opinion of his abilities, should have disliked to give up Paris is natural; but he himself afterwards records the opinion (which we share) that his removal from the metropolis was the best thing for him, as enabling him to accomplish more for botany. And as to the honours of the Institute, his disappointments were more than made up to him in the sequel by his

election as one of the eight foreign associates of the Academy of Sciences.

At Montpellier De Candolle was heartily welcomed by his colleagues, by the official personages, and by the Protestant society of the city—in those days there was little social intercourse between Catholics and Protestants in the south of France; and he gave himself with ardour and success to his new duties. He renovated the Botanic Garden—the oldest in France, founded by Henry IV.—and secured additional funds for its support. He built up the botanical school, and developed peculiar talents as an instructor, with results perhaps up to the average as respects the making of botanists; but Dunal, one of his earliest pupils, was about the only one at Montpellier who achieved a general reputation, and he fell much below expectations. He continued and extended his official botanical explorations of the provinces of France, making annual reports to the Minister of the Interior, and planning a very comprehensive work on the 'Statique Végétale de la France,' which, however, owing to political and other changes, was never written. He wrote and published the 'Théorie Elémentaire,' which made his reputation as a theoretical botanist, and well exemplifies the characteristics of his genius in this regard,—constructive, rather than critical,—quick and ingenious in seizing analogies and in framing hypotheses, rather than sagacious in testing their validity,—content with an hypothesis which neatly connects observed facts, but not so solicitous to prove it actually true, nor urgent to follow it out to ultimate conclusions,—a lucid expositor, and a happy diviner within a certain reach, rather than a profound investigator,—in short, a generalizer rather than an analyser.

At Montpellier, also, De Candolle planned his 'Systema Vegetabilium,' a systematic and detailed account of all known plants, arranged under their natural families; and he there prepared the first volume of this work—thus, with characteristic ardour and courage, but without calculating its immensity, entering upon the grand and most important undertaking of his life, and into that field of labour in systematic and descriptive botany for which he was eminently adapted, by his enterprising disposition and unflagging industry, his capacity for sustained labour, his excellent memory, his spirit of order and method, his quickness of eye, and his great aptitude for generalization.

The overthrow of the Empire, the Restoration, the Hundred Days,

and the final fall of Napoleon supervened. De Candolle's life at Montpellier was troubled and his prospects precarious. He naturally turned to his native Geneva, where he had kept up intimate social relations; and when he had ascertained that a place would be provided for him, he exchanged the comparatively ample emoluments of the chair at Montpellier, for the very humble salary of one at Geneva, encumbered with the duty of lecturing upon zoology as well as botany.

Pending the change, he made a visit to England, in 1816, of which a detailed account is given, with reminiscences of the botanists and others whose personal acquaintance he then made. His account of Brown is expressive of the great respect he entertained for him, and that of Salisbury and of Lambert is amusing.

Settled now at Geneva, at the good working age of thirty-eight, the narrative of his steadily-industrious and prosperous life, and of his happy surroundings, flows on for nearly 200 pages, down to the sad overthrow of his health by an overdose of iodine in 1836; his partial convalescence and resumption of botanical work in 1837; and ends with the record of the death of his only brother, at the beginning of the year 1841, only eight months before his own.

These twenty-five years witnessed the publication of the two volumes of the 'Systema;' the change of plan to a 'Species Plantarum' in a restricted form, more nearly within the limits of a mortal's life and powers; the publication of the 'Organographie' and of the 'Physiologie Végétale;' and—not to mention a hundred other botanical and sundry miscellaneous writings, of greater or smaller extent—of seven out of the present fifteen volumes of the 'Prodromus.' Only one botanist of the present century—and one, happily, who still survives—has accomplished an equal amount of work, and good work, in systematic botany.

It is not for us to pronounce on De Candolle's relative rank in the hierarchy of naturalists. He incidentally once speaks of Brown and himself as rivals for the botanical sceptre. It is natural that they should be compared, or rather contrasted; for they were the complements of each other in almost every respect. The fusion of the two would have made a perfect botanist. But De Candolle's facility for generalization, zeal, and industry were as much above, as his depth of insight and analytical power were below Brown's. The one longed, the other loathed, to bring forth all he knew. The editor compares

De Candolle's traits of character with those of Linnæus, as delineated by Fabricius, and finds much resemblance. But his impress upon the science, however broad and good, can hardly be compared with that of Linnæus.—*Abridged from the American Journal of Science and Art, Second Series, with corrections by the Author.*

MEMORANDA.

LIQUOR PREPARED FROM THE CASSAVA ROOT.—Intoxication is common at certain seasons amongst the Indians of Nicaragua. The liquor is made from cassava, in the same manner as Cook found the Sandwich and other South Sea Islanders making ava or kava; it is chewed by the women, after boiling the roots; about one-third is chewed, the rest pounded; then hot water and cane-juice is poured upon it, and after two days' fermentation it is ready. It looks like buttermilk, and is sour, but very strong. Can there be any philological connection between the American terms "Cassava" or "Kasava" and the Polynesian "Kava" or "Ava," supposed to be derived from the Sanscrit "Kasya" (= intoxicating beverages)? Strange to add, preparing an intoxicating liquor from the cassava, or yuka, (*Manihot Aipi*, Pohl,) is also practised in the interior of Peru, where the Indians call it "Masato." Antonio Raimondy, in his 'Apuntes sobre la Provincia litoral de Loreto,' (Lima, 1862, page 132,) gives a circumstantial account of it which, from its ethnological importance, ought to be compared with the description of the preparation of kava furnished by Dr. Seemann in his 'Viti,' (London, 1862,) page 327: "In order to get an idea of the way in which this beverage (*masato*) is prepared, it is necessary to enter for a moment one of the great houses of the heathens of Ucayali on the eve of a great festival. On one side are seen several half-naked women seated on the floor around a heap of yucas, and occupied in peeling the skin off them. On the other side is a woman busy in putting the cleaned roots in a huge pot. After this has been done, a small quantity of water is put in the pot, the yucas are covered over with leaves, and then boiled. When boiled, they are mashed. . . . Advanced to this state, the most important, and at the same time most disgusting operation is proceeded with. The women, and in some instances the men also, sit down once more in a circle around the mashed yucas, taking large handfuls of it in their mouths, which they chew without swallowing until completely saturated with saliva and almost become liquid. In this state the filthy mass is spit out, and the operation repeated until the required quantity is prepared. After this a small portion of mashed yuca is mixed and kneaded with the chewed mass and then put into the pots, which are covered up till fermentation sets in. The saliva contained in the mashed yuca produces fermentation, changes the starch into sugar, and the sugar into alcohol—a process which, according to the state of the temperature and the existing quantity of saliva, takes place in two, three, or four days. This fermented mass accompanies the

Indians on all their journeys. When wishing to prepare from it their disgusting beverage, it is dissolved with a little water."—*Captain Bedford Pim's 'Gate of the Pacific,' p.* 77.

COLOURING MATTER OF THE RED SEA.—Mr. H. J. Carter, in the 'Annals of Natural History' for March, 1863, writes that *Trichodesmium Ehrenbergii*, the *Oscillatoria* that colours the waters of the Red Sea, is more frequently yellow than red, and only occasionally green. From analogy, he considers that the green is the original colour of the plant, and consequently suggests that as much of Montagne's generic character as relates to its colour should be reversed, viz. "primo rubro-sanguinea, tandem viridis." He has also ascertained that it occurs in the Indian Ocean and the Sea of Oman as well as in the Red Sea, thus establishing the correct observation of the Greeks, who applied the name "Erythræan" to all the seas which washed the shores of Arabia.

NEW PUBLICATIONS.

Die Culturpflanzen Norwegens beobachtet von Dr. F. C. Schübeler, Conservator d. botan. Museums d. Kgl. Norw. Universität; mit einem Anhange über die altnorwegishe Landwirthschaft, etc. Christiania: Brögger und Christie. 1862.

There are, doubtless, many who will remember the collection of the "vegetable products of Norway" in the late International Exhibition, and who felt surprised when they learnt, perhaps for the first time, that even at Alten, in West Finmark, under the same parallel of latitude (70°) under which the ice-bound and barren regions of Victoria Land, Disco Island, etc., are situate, both agriculture and garden cultivation can be successfully carried on. The fact is, that Norway enjoys a far milder temperature than any other country in the world under the same latitudes, owing to the influence exerted by the Gulf Stream. This remarkable current impinges on the Norwegian coast, somewhere about lat. 62°, and follows it at a greater or lesser distance to the Russian frontier on the Arctic Ocean. In consequence of this, the sea never freezes along the whole extent of the western and northern coasts. But this is not the only influence. The long days of summer, or, in other words, the continued light, play a most important part in the vegetation of the country; and while the earth does not therefore become so cooled during the short nights, as is the case in more southern climes, vegetation continues day and night without interruption. Dr. Schübeler devotes several pages to a consideration of the various theories that

have been entertained regarding the effect exerted by the luminous, the heating, and the actinic or chemical rays of the sun, and proceeds to give several interesting illustrations of the acclimatization of plants. It is a well-known fact that the temperature of the atmosphere and of the soil decreases inversely as the distance from the equator. Consequently, it might be supposed that a greater length of time would be required for the development of a plant the further it is found towards the north; and yet corn and plants will ripen under a *much lower temperature* and in a much *shorter time* in Norway than in countries more to the south. Dr. Schübeler has also remarked that when corn or other seeds are brought from a southern to a northern clime, they require at first a longer time to ripen than the same species which have been cultivated there for some time. But after the lapse of two to three years they lose this peculiarity. And *vice versâ*, that seeds brought from a higher to a much lower latitude will, in the first year or two, ripen earlier than the corresponding plants of the same species which belong to that lower latitude. He has, moreover, noticed another peculiarity, viz. "so long as a plant is not cultivated further than it is able to attain its full development, the seed increases in size and weight for the first two to three years the nearer it approaches this limit; but it diminishes in like manner, if cultivated several degrees further south." Again: "The further north a plant is cultivated, the more strongly does the pigment of the epidermis become developed. This peculiarity is very marked in several varieties of yellow peas and kidney beans. When cultivated however under a more southerly latitude, this peculiarity disappears."

Those who have travelled in northern latitudes cannot fail to have observed the intense brightness of the foliage, and the vivid colours of the flowers. But not only is this the case, but the aromatic properties of fruits and plants may be perceived to increase the higher north they are found, while at the same time their sweetness diminishes in like proportion. This peculiarity has not escaped the notice of foreign horticulturists; thus Dr. E. Morren, in the 'Belgique Horticole,' remarks of a new variety of apple, the "Kaupanger Apple," introduced into Liége from Norway :—"Cette variété est particulièrement recommandable, et . . . pendant les trois mois qu'elle a pu être conservée, elle n'a cessé de répandre un arôme fin et très-pénétrant. La chair est ferme et aromatisée." And again, in speaking of the *précocité* of trees

and plants in the North, he adds :—" Le principal problème à résoudre dans l'amélioration ou l'introduction des races agricoles, est en Norvége la précocité. . . . Cette précocité se développe successivement avec les années, comme si les plantes n'obéissaient pas tout à coup à l'influence du nouveau climat sous lequel on les a transportées, mais exigeaient plusieurs générations successives pour s'y habituer. Mais ce qui est plus remarquable, et d'un grand intérêt pour la théorie de l'acclimatisation des végétaux, c'est que cette précocité tend à se fixer et à se constituer à l'état de race." And he concludes: " Les conséquences à tirer de ces données, c'est qu'il faut développer et aller chercher dans le Nord, des variétés précoces de la plupart des végétaux utiles que nous cultivons."

Adopting the system of Endlicher, Dr. Schübeler proceeds to treat of the Amphibrya (Monocotyledones) and Acramphibrya (Dicotyledones). In the former of these the author mentions many interesting experiments which he has made with the cereals, and which to his own countrymen must be of peculiar value. The results arrived at from his experiments with *Zea Mays* will be found treated of in detail at pp. 35–44; and Dr. Schübeler comes to the conclusion that though it would by no means be profitable to cultivate Maize for the sake of its grain, yet as green food it might in some places answer. Barley, which from the last census composed 24·1 per cent of the whole corn-produce of the country, can be grown as far north as lat. 70°; and, as an instance of the peculiar effect the long days have on the vegetation in these parts, it is worthy of notice that it will grow 2½ *inches in the twenty-four hours for several consecutive days at Alten, lat.* 69° 57′. Oats (*Avena sativa*, L., " Havre," Norsk) are the most generally cultivated grain in Norway, and form 55·8 of the whole corn-produce. Their northern limit is lat. 69° 3′. It may not, perhaps, be generally known that in years of scarcity, it is a common thing for the peasants to mix oatmeal with the bark of certain trees. Wheat is but little cultivated, and by the last census comprised only 1·4 of the whole corn-produce. When it is borne in mind that of the 121,800 square miles which Norway contains only 1060 square miles are tillable, it will be seen that the corn imports must figure rather largely in the commercial returns of that country.

Space alone prevents us from making more extracts from Dr. Schübeler's interesting volume; but we must append one or two remarks on the Dicotyledonous plants. The northern limit of *Pinus Abies* is

lat. 67°. A group of the *Pinus orientalis* has been said, however, to be discovered under lat. 69° 30′ near the Russian frontier. *Pinus sylvestris* grows over the whole country, as far north as East Finmarken, and attains rather a higher altitude on the mountains than the last. Birch-trees of 70 to 80 feet high, with stems from 9 to 18 feet in circumference, are found in several places in Norway, and generally belong to that variety named the Weeping Birch. For many interesting remarks, and for the peculiar uses to which the Birch-bark ("Næver," Norsk) is put, the reader is referred to Dr. Schübeler's book, pp. 65–70. When one takes the latitude into consideration, the Oak-tree (*Quercus pedunculata*, Ehrh.) may be said to attain a very considerable size in the southern districts. The largest specimen in the country, lat. 59° 40′, is 125 feet in height, and 26 feet in circumference. One of still larger dimensions had formerly stood near this, but some years ago was blown down. Of its size Dr. S. can only judge from report. We quote his own remarks:—"Vier und zwanzig Ackerleute eines Tages vor einem unerwartet aufsteigenden Unwetter Schutz im Innern der alten Eiche suchten; zwei und zwanzig Personen fanden Obdach darin; von den beiden anderen heisst es sehr naiv, 'Sie blieben draussen.'" The *Prunus Padus* ("Hæg," Norsk), which is only found as a shrub or small tree in Scotland, attains a goodly size in Norway. The writer has seen a specimen growing near Laurdal church, in Thelemarken, lat. 59° 25′, 36 feet in height, the stem $5\frac{1}{2}$ feet in circumference, and the crown 38 to 39 feet in diameter. The Juniper ("Ener," Norsk) often grows to a comparatively large size. Dr. Schübeler speaks of the stem of a Juniper-tree, from Throndhjem, $8\frac{1}{2}$ feet in length. "Der Durchschnitt am Wurzelende beträgt $12\frac{1}{2}$, an der Spitze $7\frac{1}{2}$ Zoll. Die letzen 63 Jahrringe füllen den Raum von 1 Zoll norw. . . . Der Baum ist unter 63° 25′ 45″, 300 Jahre alt geworden." The largest Juniper-tree in Norway may be seen in Haabel, lat. 59° 36′, a few miles south of Christiania: it is 25 feet in height. At a distance of 2 feet from the ground the stem measures 7 feet 3 inches in circumference; the crown has a diameter of 26 feet. The *Ilex Aquifolium* ("Christtorn," Norsk) grows wild on the coast up to lat. 62°. Thus, under lat. 59° 45′, on Stordö Island, near Bergen, there is a Holly-tree 47 feet high; "under which latitude," remarks Dr. Schübeler, "the Holly is scarcely to be found in any other place in the world, either in a wild or in a cultivated state."

The chapter on Norwegian agriculture in olden times, will be found to be replete with interest. A well-executed map, showing the altitudes of the various parts of the country, and the limits at which the cereals and trees will grow, is appended, followed by statistical tables of meteorological interest, and several plates of some remarkable trees. On the whole, the volume will well repay study, and evinces unmistakable signs that the author is a man of great observation and of practical worth to his countrymen.

BOTANICAL NEWS.

The office of Colonial Botanist at the Cape of Good Hope, vacant by the death of Dr. Pappe, has been conferred upon Mr. Brown, of Aberdeen, who has travelled over a considerable part of Africa.

The Berlin Academy has elected Mr. Charles Darwin a Corresponding Member.

At the Geological Society, on March 18th, Dr. H. Porter read a paper on the occurrence of large quantities of Drifted Wood in the Oxford Clay near Peterborough. This deposit had been exposed at that locality in clay-pits, thus enabling the author to carry on investigations regarding the fossils which there occur in it; he found the formation to be extremely rich in organic remains, and, besides containing many species of Ammonites and other Mollusca, to include large quantities of drifted wood, the fragments bearing on their surface the impressions of Ammonites.

Mr. R. Brown, a student of Edinburgh University, who has distinguished himself in his natural history pursuits, has gone to British Columbia on behalf of an Edinburgh association to collect plants and seeds suitable for cultivation at home. It is his intention to remain for three years in the colony, and to form collections in every department of natural history, making the vegetable productions however his principal object.

The accommodation provided in the University of Cambridge for the Professors of Anatomy, Botany, and Chemistry, and their various teaching collections, has hitherto been exceedingly inconvenient and insufficient. The University have just decided to remedy this. A new building is to be erected for the accommodation of some of these professors. The plans include not only a lecture-room for the Botanical Professor, but also a museum for the University Herbarium, which contains many large and valuable sets of plants besides the whole collections made by the late Dr. Lemann, consisting of more than 30,000 species, and presented to the University in accordance with his desire.

The Botanical Gardens at Chelsea were the first public gardens established in London for purely scientific purposes. Induced, as it is likely, by utilitarian motives, the Society of Apothecaries established this garden in 1673, but instead of making it simply a druggists' market-garden, they devoted it to a larger

purpose—the advancement of botany as a science. And for two centuries, at considerable expense, they have maintained its efficiency, during all which time it has supplied valuable facilities to the successive generations of the medical students of the metropolis for the prosecution of an important branch of their professional studies. Within the last few years, the expenses of its cultivation, the increase of buildings and manufactories around it, and the threatened inroads of railway companies have created a feeling of discouragement among its owners, and even suggested the advisability of discontinuing it. The continued importance of the garden however to the medical students, as shown by the large number (no fewer than 500) who sought admission for the purposes of study during the past summer, have induced the executive of the Apothecaries' Society not only to keep up the garden but to devote a larger sum to put it in a more efficient condition. It is intended to make a new and extensive collection of medicinal and economical plants, to enlarge the collections of the more important hardy herbaceous plants, and to arrange them according to the natural system, to construct a cold-house, or mere glass shelter, in order to show experimentally the value of such protection in growing plants in a town atmosphere, and to illustrate by examples the utility of Wardian cases in cultivating plants and in conveying them from distant countries. The Society have wisely committed the whole matter to N. B. Ward, Esq., F.L.S., to whose persevering exertions, to a great extent, the present encouraging position of the gardens is owing. In the carrying out of these objects, he will have abundant scope for the practical application of that extensive acquaintance with the science which during his long and active life has been his favourite pursuit. But the most novel, as it will be the most attractive feature in the renovated gardens, is the proposal to convert the old lean-to houses into "aspects of the vegetation of tropical and temperate climes." Only those who have seen the wonderful "aspect of vegetation" at The Ferns, Clapham, can have any idea of what will be the effect of the large houses when completed according to Mr. Ward's plans. The co-operation of Mr. Thomas Moore, the present Curator of the Gardens, whose numerous and valuable works are well known, will further ensure the successful accomplishment of these designs. No appeal is made to the public on behalf of this matter; but we would suggest that much help might be rendered to Messrs. Ward and Moore in this important public undertaking by our national establishments at Kew, Edinburgh, and Dublin, supplying them with some of the duplicate plants which either inconveniently crowd their houses, or must of necessity be got rid of.

At a meeting of the Botanical Society of Edinburgh, February 12th, Professor Balfour, V.P., in the chair, the following communications were read:— 1. Notice of Plants collected in the counties of Leeds and Grenville, Upper Canada, in July, 1862. By George Lawson, LL.D., Professor of Chemistry and Natural History, Queen's College of Canada. 2. A Record of the Plants collected by Mr. Pemberton Walcott and Mr. Maitland Brown in the year 1861, during Mr. Gregory's Exploring Expedition into North-West Australia. By Ferdinand Mueller, M.D., Ph.D., F.R.S., Government Botanist for the Colony of Victoria. Communicated by Professor Balfour. 3. Extracts from

Indian Letters from Dr. Cleghorn. Communicated by Professor Balfour. 4. Notes on the Physiological Action of the Calabar Poison Bean (*Physostigma venenosum*, Balfour). By Thomas R. Fraser, M.D. This paper was an abstract from Dr. Fraser's graduation thesis of last session. It was concluded from an experimental investigation that the spermoderm of the Calabar bean possesses properties as a sedative of the spinal cord, hydragogue cathartic, and diuretic. The most energetic action was obtained from the kernel. [Dr. A. Robertson proposes the Calabar Bean as a new ophthalmic agent, having an action somewhat opposite to that of Belladonna. By experiments he has shown that it induces a condition of shortsightedness, and occasions contraction of the pupil, and sympathetic dilatation of the pupil of the other eye.—Edin. Med. Journ. March, 1863.] 5. Register of the Flowering of Spring Plants in the open air, at the Royal Botanic Garden, Edinburgh. By Mr. M'Nab. The register showed the dates at which the flowering took place in 1861, 1862, and 1863 respectively.

Sydney, Oct. 26th.—The improvements lately carried out in the Botanic Gardens deserve to be noticed as adding to the attractions of a spot of which the people of Sydney are justifiably proud, and the natural and artificial beauties of which excite great admiration from strangers on their arrival in the colony. The Botanic Gardens have always been a favourite resort with the residents of Sydney; but their features of interest have been greatly increased since the addition of a zoological to the botanical collection. A further addition of about two acres in extent has been made to the Lower Garden. The Garden now reaches to the Governor's bathing-house, which may be said to complete its extension in that direction. The greater portion of the reclaimed land is being made into a lawn, and will be used for the purpose of illustrating the most ornamental trees, particularly the varieties of the bush forest vegetation of this colony, now being rapidly destroyed by the clearing that is going on on the banks of the rivers to which those trees are peculiar. One of the principal improvements in the Lower Garden consists in the illustration of the exogenous plants by means of compartments, each compartment or bed representing some family; the whole are divided by broad walks into four grand classes, the hypogynous, perigynous, epigynous, and diclinous, which are again subdivided into alliances, etc. It is intended, as soon as this illustration of classes is completed, to grow only the more ornamental plants of the families, as no attempt will be made at a collection. The planting of the beds is in progress, and all that now requires to be done to render the classification available for students is for the families to be named. A rustic house has been erected close to this ground, for the purpose of affording shelter in case of rain, and also generally for the convenience of botanical students. The house is octagonal in shape, each alternate side being open, the close sides being formed of ironbark saplings, in various ingenious designs, each part of a panel having a different design. The inside of the roof is also made of ironbark saplings, all of which taper towards a point. The floor is neatly paved with octagonal blocks, and seats are being placed against the closed sides, and also round a table in the centre. The roof is thatched with

Grass-tree (*Xanthorrhœa*). An artificial pond has also been constructed in the Lower Garden, partly for the purpose of ornament, but principally for the growth of aquatics. At present the pond contains the white Water-lily of England, and the large blue Water-lily of New South Wales. It is hoped shortly to introduce the pink Water-lily of the northern rivers. At one extremity of this pond, and forming a suitable boundary to it, is some neat and ornamental rockwork; at the other extremity, the raised bank is planted with evergreens, which will, when grown, present a very attractive feature. The rockwork is just now very gay, with several species of Mesembryanthemum and other plants in full flower. A further improvement is about to be carried out by the formation of a public road round the shore of Farm Cove, for which purpose a considerable space in front of the Garden, to a little beyond low-water mark, will be taken in. The front of the garden will be enclosed by means of an iron railing on a stone basement. The road round the Bay will be a portion of the main drive, extending from the continuation of Macquarie Street, round by Fort Macquarie, and on to Mrs. Macquarie's Chair, where it will join the present drive. At each end of the water-frontage of the Garden a lodge is to be erected, at which men will be stationed for the protection of the Garden. The sum of £1500 was voted last week for these improvements. This sum will be expended chiefly in reclaiming the land, in building a retaining wall, and in paying for the dredging. The Gardens present at this season of the year their most attractive appearance; and notwithstanding the general drought from which they have lately suffered, the vegetation is healthy and promising. The trees and climbers now most admired for their beautiful blossoms are the *Hymenosporum pittosporoides*, the *Erythrina secundiflora*, the *Erythrina speciosa*, the *Bignonia Tweediana*, the Judas-tree (*Cercis Siliquastrum*), the *Thunbergia laurifolia*, the *Bougainvillæa spectabilis*, the Magnolias, Silky Oak (*Grevillea robusta*), the Spiræa, several species of Acacia, the Roses, and other wall flowers; these give the Gardens a luxuriant vernal aspect. The zoological collection, though at present a small one, has for some time past constituted a very attractive feature of the Botanic Gardens. Some interesting additions have recently been made to the collection; indeed, it has now increased considerably beyond the amount of accommodation.—*Sydney Herald.*

Dried Plants for Sale.—Dr. C. H. Schultz Bipontinus has on hand a number of sets of European *Cichoraceæ*, which he wishes to dispose of at the rate of £2. 6*s*. 8*d*. per hundred. We have seen a century of them in Sir W. J. J. Hooker's herbarium. Their being named by Dr. Schultz greatly enhances their value. The specimens are good, and to each is attached a printed label with the name, synonyms, reference to where the plant is described, locality, and often copious notes. Sets may be had by applying to Dr. D. H. Schultz Bipontinus, Deidesheim, Germany. A. A. B.

Mr. Sutton Hayes, a zealous and enterprising botanist, residing at Panama, has recently sent to England some small sets of plants collected in that interesting locality. They are mostly named and in good condition, and may be had for £2. 2*s*. per hundred. Mr. Daniel Hanbury, of Plough Court, Lombard Street, London, has kindly consented to distribute them.

Tab 5.

TROPÆOLUM HEYNEANUM, *Bernh.*, A LITTLE-KNOWN SPECIES FROM SOUTHERN PERU.

By Berthold Seemann, Ph.D., F.L.S.

(Plate V.)

Mr. Clements R. Markham, when on his way to the Chinchona-forests of Caravaya, met with a pretty *Tropæolum* with orange-coloured blossoms, amongst fields of Indian-corn about Arequipa, and speaks of it, in his 'Travels in Peru and India,' p. 78, as *Tropæolum Canariense.* It is indeed the nearest ally of the species that goes in our gardens under that name, and is properly called *T. peregrinum*, Linn., but its flowers are not of that clear canary-bird-like colour, and the shape of the leaves and petals, and, above all, the spur of the calyx, are different. It is also easily distinguished from *T. bicolor*, R. et Pav. (which I cannot agree with Don in regarding as identical with *T. peregrinum*, Linn.), by not having stipules. The plant Mr. Markham brought home does not exist in any London herbarium, nor is it figured in any work consulted, and none of the descriptions given in systematic books quite agree with it. My conclusions that it might possibly be *Tropæolum Heyneanum*, of Bernhardi, were shared by my excellent friend Mr. Miers, who thought he remembered seeing the plant in the gardens of Lima. The part of Bernhardi's description not agreeing with Markham's plant ("pedunculis solitariis sub-2-floris") was explained away by Mr. Miers as a mistake possibly arising from confounding a young axillary branch with two buds for a peduncle. There being only *one* *Tropæolum* (*T. umbellatum*, Hook.) where the peduncle has more than one flower, such a character was of importance, and I had my doubts as to the correctness of the determination; they were finally overcome by my friend Mr. Otto, Curator of the Botanic Gardens, Hamburg, who informed me that he has seen the plant in cultivation, but that it has entirely disappeared from German gardens, rendering the supply of seeds for which Mr. Markham some months ago has written to Peru highly acceptable. *T. Heyneanum* is described, besides in the 'Thüringer Gartenzeitung,' in the 'Hamburger Gartenzeitung.' Baron Biedenfeld found it about Huanuco on irrigated fields (Allg. Gartenz. xiii. p. 108), and says that it requires more warmth than other species of the genus, and, as it is an annual, the seeds should be raised in our

latitudes early in a frame before they are transplanted into the open border.

After carefully weighing all the evidence, I think there can be no doubt of Mr. Markham's plant being *T. Heyneanum*, of which the following is a brief diagnosis:—

TROPÆOLUM *Heyneanum* (Tab. V.); annuum, scandens, sparse pilosum; foliis peltatis, 3–5-lobis, lobis oblongis integerrimis vel lobulatis, mucronatis; stipulis bracteisque nullis, pedunculis 1-floris folium multo superantibus, calcare basi attenuato leviter deorsum curvato; petalis 5 (omnibus aurantiacis), unguiculatis, flabellato-spathulatis inciso-multifidis, laciniis petalorum duorum superiorum obtusiusculis, inferiorum 3 subulatis; staminibus liberis; antheris rotundatis (viridibus); stylo 3-fido, laciniis 2 brevioribus (v. s. sp. comm. clar. Markham).

Tropæolum Heyneanum, *Bernhardi, in Thüringer Gartenzeitung, pro* 1843, *p.* 73; *Walp. Rep.* ii. *p.* 820; *Ed. Otto, Hamb. Gartenzeitung,* 1859, *p.* 218; *Biedenfeld, in Otto und Dietr. Allg. Gartenz.* xiii. *p.* 108; *Tab. nostr. n.* 5.

GEOG. DISTR. Arequipa, in maize-fields (*Markham !*), Gardens of Lima (*Miers*), irrigated fields about Huanuco (*Biedenfeld*).

EXPLANATION OF PLATE V.

Tropæolum Heyneanum, Bernh., from specimens collected by Mr. Markham about Arequipa.—Fig. 1. One of the lower petals. 2. One of the upper petals. 3. Pistil:—all magnified.

REMARKS ON *GLADIOLUS ILLYRICUS, Koch,* AND ITS ALLIES.

BY J. T. BOSWELL SYME, ESQ., F.L.S.

On the 28th of June, 1858, I went to Lyndhurst in search of the *Gladiolus*, the discovery of which had been announced in the 'Annals of Natural History' for August, 1857. On arriving there I inquired for the Boldrewood Road, and without much difficulty found the station recorded for the *Gladiolus* in that locality. The best way of finding the plant is to stoop down and look through between the leaf-stalks underneath the fronds of the *Pteris aquilina*, when, if the *Gladiolus* be in flower, the crimson spikes may be discerned at a considerable distance. Having seen the plant growing, I am in a position to con-

firm the opinion of those who consider that it is really indigenous; but as Mr. Wise has found it in abundance in several other localities, few will now be inclined to deny its claims to rank as a native plant in England. A corm of the *Gladiolus* brought from Lyndhurst, and planted in Mr. Hewett C. Watson's garden at Thames Ditton, has flowered there and produced capsules. Mr. Watson informs me that the capsule is obovate, flattened at the top, with three keels. Professor Babington is doubtless right in referring the New Forest *Gladiolus* to *G. Illyricus*, Koch; the only others with which it could be confounded being *G. imbricatus* and *G. communis*, Koch. The former is not found to the west of Germany, and though as slender, has a taller, stiffer stem, more numerous and closer flowers, which are shorter, and with the segments of the perianth (especially the three upper ones) more suddenly expanded, the expanded part assuming a rhomboidal instead of an oval form,—much the same shape as those of *G. palustris*, Gaud.; but that has the lower perianth-segments considerably longer than the three upper ones, and the fibrous covering of the corm consists of stronger fibres, which, at the summit, where they anastomose, form broadly ovate, or polygonal meshes. From the plant usually termed *G. communis* by Continental botanists, the only points in which *G. Illyricus* seems to differ are the shorter and more slender stem, narrower leaves, shorter and less numerous flowers of the latter. Distinguishing characters have been laid down between *G. communis* and *G. Illyricus*, drawn from the form of the stigmatic lobes, the shape of the anther-cells and the seeds, but I fear they are of little value. In *G. communis*, which is described as having the stigmatic lobes gradually enlarged from the base to the summit, I find that they are so only when the flowers first expand; these lobes are at first longitudinally folded and oblanceolate.* They afterwards open out, and besides this the upper part actually increases in breadth so that they become spathulate, with a narrow base and an oval lamina; precisely what is described as the distinguishing mark of *G. Illyricus*, in which plant, however, I have not yet had the opportunity of observing if this change of form takes place. The anther-cells which Koch describes as "at length divaricate at the base," are certainly often so in the dried specimens, but not in the New Forest plant when alive. As to the seeds, they are

* This word does not seem to be in use among English authors, but I follow Professor Asa Gray in employing it to designate a form for which we have no other precise term.

said to be narrowly winged in *G. Illyricus*, and broadly so in *communis*, but there appears to me to be no difference between those of specimens of the former from Toulon, and the *G. communis* of our gardens.

These three plants therefore seem to be merely subspecies of one superspecies, to which the name *communis* properly belongs; and following the nomenclature adopted in the third edition of 'English Botany,' the form called by Koch, and Godron and Grenier *communis* might be distinguished as *eu-communis*, the others of course retaining the names by which they are already known.

It may perhaps be asked, what is the use of this double set of names? The answer to this query is, that it is necessary to speak of both the including and included groups, and therefore it is well to have a name by which to call them. The botanist whose attention is directed to the plants of the whole world, and the botanical geographer comparing the species of different countries, find the more comprehensive terms most convenient for their purposes; whilst the monographer and the botanist who devotes his attention to the plants of a limited geographical area find the necessity of having designation for the subspecies or groups of plants, the difference between which is slight though certainly existing. Botanical science has arrived at such vast dimensions that it is only by a division of labour that real advance can be made; and each section of labourers, though working in concert for a common end, requires its own special tools.

In making comparisons between the number of species in a genus or Order in two countries, only one of which has been thoroughly explored, it would give a very false idea if we were to take the splitters' species (verspecies plus subspecies) from the latter, and contrast them with the species (verspecies plus superspecies) from that country which had not had the benefit of the same minute examination. If we counted Professor Parlatore's species of *Gladiolus*, as representing plants having the same amount of difference as the species enumerated from the Cape of Good Hope, the inequality of the development of the genus *Gladiolus*, as represented in Europe and South Africa, would appear very much less than it really is.

Careful study shows that there are permanent hereditary differences between plants which have been included by less minute observers under a single name, and whatever exists in creation is deserving of attention. Moreover all accurate classification must proceed from indi-

viduals upwards. A Natural Order would be very ill defined by a botanist who was ignorant of the characters of the genera which he included in it, or a genus by one unacquainted with its component species. No doubt this is frequently done, and then some more careful observer comes into the field and upsets the work of the first. In the same way, superspecies can only be satisfactorily established by those who are acquainted with the most restricted groups of permanent forms which compose them. It is, in a great measure, owing to this, that botanical nomenclature is so fluctuating. The imperfect knowledge which the founder of a species has of the plants which he includes in that species, often leads him to admit under it aberrant forms belonging to some other type, and to exclude aberrant forms of his own species. The only real starting-points are individual plants, among which we find some forms which are hereditarily constant in those points in which they differ from others, producing races which are practically permanent for such periods of time as our observation extends over. Some of these races are comparatively widely separated, even from those which most nearly resemble them, and such constitute what Mr. Watson has termed verspecies, about which there is no difference of opinion. Others, again, approach much more nearly their neighbouring races; these are the so-called subspecies, which have to be grouped together to compose superspecies. But if superspecies are formed without an accurate knowledge of their subspecies, artificial instead of natural groups are likely to be the result.

The number of European species of *Gladiolus* enumerated in Koch's 'Synopsis,' Ledebour's 'Flora Rossica,' Grenier and Grodron's 'Flore de France,' Parlatore's 'Flora Italiana,' and Willkomm and Lange's 'Prodromus Floræ Hispanicæ,' is twelve, of seven of which I possess specimens. These seven appear to belong to three species, two of which are superspecies :—

1. *G. communis*, Linn., including *C. communis*, Koch (eu-communis mihi), *G. Illyricus*,* Koch, and probably also *G. imbricatus*,† auct. plur. (not Linnæus), and *G. palustris*, Gaud.‡

* *G.* "*spicatus*" of Linn. Herb.!

† *G.* "*imbricatus*," in the Linnean Herbarium, is represented by a deformed specimen of *G. eu-communis*!, with the flowers crowded together, from the spike not having lengthened before the flowers expand.

‡ The meshes of the fibrous covering of *G. Illyricus* from Lyndhurst are occasionally quite as wide as those of *G. palustris*.

2. *G. Byzantinus*, Mill.

3. *G. segetum*, Gawl., including under this name *G. eu-segetum*, mihi, and *G. Guepini*, Koch.

With regard to the other five alleged species, of which I have seen no specimens, it will probably be found that *G. Reuteri*, Bois., *G. Notarisii*, Parl., and *G. spathaceus*, Parl., are additional subspecies of *G. communis; G. dubius*, simply a synonym of *G. eu-communis;* and *G. Inarimensis*, Guss.; a pseudo-species made up of flowering specimens of *G. communis*, and fruiting ones of *G. segetum*, and if there has not been confusion of this kind, it may be a hybrid between the two.

ON A NEW CHARACTER IN THE FRUIT OF QUERCUS, AND ON THE BEST SUBDIVISION OF THAT GENUS.

By Alphonse de Candolle.

[*Translated from the Biblioth. Univ. (Arch. des Sciences Phys. et Nat.) for October*, 1862.]

The general and differential characters of *Quercus* have been much studied of late years, especially by M. Gay, whose accuracy is everything that can be wished. I was not then surprised, in examining the genus *Quercus* and its allies, for publication in the 'Prodromus,' to find most of the doubtful points cleared up. The only difficulties which I encountered relate to the limits of species and their synonyms. I hope to speak of them on some future occasion, in a memoir where the examination of Oaks will serve as a basis for an inquiry into the question of species,* and restrict myself now to pointing out a new character, and mentioning some other characters of the fruit which have not been hitherto studied in a sufficient number of species.

Two excellent observers, André Michaux and his son, have stated long ago, that some Oaks ripen their fruit at the end of the first year, and others in the course of the year following. This character has been neglected for half a century, but M. Gay has the merit of recall-

* This inquiry has since been published in Bibl. Univ. Nov. 1862, entitled "Étude sur l'Espèce à l'occasion d'une révision de la Famille des Cupulifères," and an able summary of it has appeared in a recent number of the 'Natural History Review,' April, 1863.—Ed.

ing attention to it, examining and establishing it in many species of our own continent; and to him we are especially indebted for the discovery that two species have been confounded under the name *Quercus Suber*, one of which has annual, the other biennial fruit.

From being impressed with the fact that such closely allied plants should have such distinct periods of maturation, I carefully examined this character, to determine both its constancy and also how it might be combined with other characters more easily verified or more obvious. It has been examined, not only in every species of which I could obtain the fruit, but also in hundreds of individuals of the same species, perhaps altogether on two thousand specimens contained in the rich herbaria to which I have access.

The duration of the fruit is mostly easily determined, even from a dry branch; it is enough to see if the ripe fruit be fixed to the new wood or to that of the previous year. As the peduncles remain until the fruit is mature, this observation is for the most part easy; but now and then specimens occur, especially in those species with evergreen leaves, which may mislead or embarrass; but with a little care, especially by examining several fruit-bearing branches, these doubts disappear. When the young fruit-bearing branches of one year do not lengthen or branch out the next year when continuing to mature their acorns, a biennial fruit may be mistaken for annual; but on closer examination, some difference of colour, size, or pubescence is perceived between the branches of one year and those of the next, or a difference of consistence in the leaves of each year indicates the true age of the branch. Again, in herbaria, the fruit-bearing branches of the second year, whose leaves are lost in desiccation, and being in the axil of a former leaf, simulate the peduncles of the year; but in this case, the cicatrices of the new leaves and the pubescence of the branch, when compared with that on the principal axis, indicate the truth. When the character itself is once ascertained, it is found perfectly constant in each species.

Unfortunately the character stands by itself; the result is that two closely allied species may have in the one case annual or in the other biennial fruit, as, for example, in the following species:—

Quercus microphylla, Nee, has annual fruit, and *Q. Castanea*, Nee (*Q. mexicana*, H. & B.), biennial.

Q. Seemanni, Liebm., *Q. Ghiesbregtii*, Martens & Gal., and *Tlalpu-*

xahuensis, A. DC., have annual fruit, and *Q. acutifolia*, Nee, biennial.

Q. scytophylla, Liebm., has annual fruit, and *Q. calophylla*, biennial.

Q. obtusata, H. & B. (*Q. Hartwegi*, Benth.), *Q. tomentosa*, Willd., *Q. reticulata*, H. & B., have annual fruit, and *Q. crassifolia*, H. & B., biennial.

And above all, the two species before mentioned, *Q. Suber*, L., and *Q. occidentalis*, Gay, resemble each other so much that for a long period they were considered as one. [Conf. Professor Babington's note on the Cork-tree at Summertown, near Cork, Ireland, *supra*, p. 56.—Ed.]

It was only about the end of my investigation, when I had become familiar with *minutiæ* in the characters of Oaks, that I could determine at sight if a specimen without ripe fruit was annual or biennial. The character is so isolated as to be quite unfit to form the basis of a good natural clasification, and therefore I have only ventured to use it as a paragraph heading for subdivisions of genera or natural subgenera, and most of all for Endlicher's subgenus *Lepidobalanus*, which comprises the greater part of *Quercus*.

But Oaks give us another character,—one hitherto unnoticed, and probably of greater theoretical importance, though it cannot be ascertained at a glance, viz. the relative position of the atrophied ovules to the seed, which is always single, or, if you will, to the ovary. The great external resemblance of the acorns of every species of Oak has created the mistaken impression, that an equally strong resemblance exists in the interior; but it is not so, and when the five abortive ovules have been sought round that single one which becomes the seed, and when one finds how easy is the observation, it is surprising that writers have not noticed it before, and do not even allude to it. Even M. Schacht,* who has described the young ovules of *Quercus Robur* better than any one else, states when he speaks of the evolution of the fruit: "Scarcely a trace remains of the ovules which are found at the period of fertilization." But in *Q. Robur* five abortive ovules are always found below the seed, which fills the ripe acorn. They lie against the spermoderm among irregular remains of the partitions. Sometimes they are as large as a millimetre, and when less, may easily be discerned with the naked eye or a weak lens. They are attached under the seed at the

* Schacht, Beitr. i. p. 37, t. iii. This plate is reprinted in his 'Der Baum.'

base of the ovary by the remains of the placentas, and their former semianatropal evolution may easily be recognized. This *inferior* position confirms M. Schacht's accurate observation that the ovules of *Q. Robur* spring from the base of the ovary-cells and ascend, whilst most authors describe them as pendulous, or as changing their position during growth.* It is a general rule, and I have verified it in many Orders, for example, in *Myrsinaceæ* and *Hippocastaneæ*, that the ovules once formed do not detach themselves when they become abortive. They are always to be found, if looked for, in their original place of growth, so that it is frequently a convenient practice to determine the original position of the ovules by the ripe fruit. Every species of *Quercus* which matures its fruit within the year, probably has its atrophied ovules below the seed, or at least below its medium line. This has been ascertained in many American species, as well as in those of the Old World; but those species which ripen their fruit the second year, differ in having their atrophied ovules sometimes at the base, sometimes at the summit of the ovary. Every *Quercus* not included in the section *Lepidobalanus*, as well as the genera *Lithocarpus*, *Castanopsis*, and *Castanea*, bear their abortive ovules at the apex of the seed. Thus, in the subgenus *Lepidobalanus*, *Q. Cerris*, with fruit maturing the second year, and deciduous leaves, has ovules inferior, like *Q. Robur*; *Q. Pseudo-suber*, *occidentalis*, *coccifera*, *Vallonea*, etc., of our continent, and the American *Q. crassifolia*, *splendens*, etc., with fruit quite as biennial and evergreen leaves, have ovules like *Q. rubra* and *Cerris*. But a long series of American Oaks with biennial fruit and leaves either evergreen or not, such as *Q. falcata*, *rubra*, *Xalapensis*, *acutifolia*, and others, have their atrophied ovules above the seed. This will astonish American botanists much, but the fact is, in their most common species, the abortive ovules are sometimes at the base, sometimes at the summit of the seed. In *Q. macrocarpa*, *Prinos*, *stellata*, *alba*, and *virens*, for instance, the ovules are inferior, as in our *Q. Robur*; but in *Q. ilicifolia*, *falcata*, *rubra*, *palustris*, *coccinea*, *Phellos*, *imbricaria*, and *nigra*, they are superior in relation to the seed.

As might be expected, and as I have ascertained, in some species the position of the atrophied ovules in the ripe fruit depends upon their

* Endlicher (Gen. p. 274) says, "Ovula apice anguli interioris appensa;" Nees, jun. (Gen. Pl. Fl. Germ. fasc. i.), "Ovula primum erecta mox pendula," M. Gay (Bull. Soc. Bot., 1857, p. 506), not having verified their position, is silent.

original position. When the ovules remain at the summit of the ovary above the seed, it is because they were pendulous at first; when at the base, it is because they were ascending when young. The imperfect state of herbaria has not enabled me to verify this as much as could be wished, but it is quite as it should be, and I have never found it otherwise.

This difference in the attachment appears at first important enough for generic or sectional characters, but when more closely examined, and attention is paid to what closely allied species have either kind of ovules, the character is much weakened. The ovules originate laterally from the re-entering, though incomplete, partitions which divide the ovary into three cells. They originate either near the base or near the summit of the ovary, or even at a certain appreciable distance from either. Their evolution is constantly semianatropal, the exostome being turned upwards, and this of itself proves that the superior ovules do not originate precisely in the superior angle of the cell. In the specimens of *Quercus Suber* which I have been able to examine in different states of evolution, the ovules originate slightly above the base of the ovary, and the partitions are separated to the middle, as in *Q. Robur*, but the ovules being originally higher than in that species, they are found ultimately in a spiral line round the mature seed, and the highest atrophied ovule hardly extends to its middle line. If this evolution is constant, we have a specific character for *Q. occidentalis* and *Suber*, which have been so long confounded, and are so difficult to be distinguished, except by the duration of the fruit. *Q. occidentalis*, to judge by a small number of acorns,* has its atrophied ovules decidedly inferior, like *Q. Robur*. Two Mexican species have afforded atrophied ovules above the base of, though still below the middle of the seed; and in some species with superior ovules, they are placed rather below the apex; hence the character is not absolutely clear. It will be used in the 'Prodromus' to subdivide sections when combined with the duration of the fruit.

The following is an epitome of the result to which I have been led after a more complete investigation than my predecessors.

The species of the genus *Quercus* form five very natural sections or subgenera, founded on the nature of the involucre or cupula, and con-

* I hope to verify this in a greater number of specimens before the publication of the 'Prodromus,' and will then mention if anything requires correction.

firmed by characters of inflorescence and habit. They are almost those of Endlicher (Suppl. 4) and of Blume (Museum Lugduno-Bat.), with some modifications. The following is an abridged Table:—

QUERCUS.

Sectio I. LEPIDOBALANUS (*Quercus*, L.; *Quercus* sect. *Robur*, *Cerroides*, *Erythrobalanos*, *Cerris*, *Gallifera*, *Suber*, *Coccifera*, Spach; *Quercus A. Lepidobalanus*, Endl. excl. spec.).—Amenta gracilia, pendentia; floribus omnibus masculis solitariis, absque rudimento pistilli; bracteis solitariis, caducis, interdum (in spec. Americanis) deficientibus. Stamina plerumque erga perigonium non manifeste symmetrica. Cupula squamis imbricatis tecta, ore aperta. Ovula abortiva, nunc prope basin, rarissime in medio, nonnunquam prope apicem seminis persistentia. —Omnes ex hemisphærio boreali.

II. ANDROGYNE (*Q. densiflora*, Hook., species sectionis *Lepidobalani*, Endl.).—Spicæ imâ basi flores fœmineos, supra masculos gerentes, erectæ. Flores masculi fasciculati, fasciculis 3-bracteatis, singuli absque rudimento pistilli. Stamina numero duplici loborum perigonii, antheris minimis. Stigmata 3–6, in div. floribus rami. Cupula sect. *Lepidobalani*. Ovula abortiva erga semen supera.—In Californiâ.

III. PASANIA (sect. *Lepidobalanus*, Endl., partim; *Quercus* § 2. Blume, Mus. Lugd.-Bat.; sect. *Pasania*, Miq. fl. adjunctis char.).—Amenta erecta, floribus masc. sæpius fasciculatis, fasciculis 3-bracteatis. Pistillum rudimentarium, liberum. Stamina sæpius numero duplici loborum perigonii. Flores fœminei secus spicas segregatas vel basi spicarum androgynarum. Flores fœm. et ideo fructus sæpe involucris conniventibus. Cupulæ *Lepidobalani*. Ovula abortiva supera.—In Asiâ meridionali.

IV. CYCLOBALANUS (Endl. Gen., anno 1847; sect. *Gyrolecana*, Blume, Mus. Lugd. anno 1850).—Inflorescentia et flores masc. *Pasaniæ*. Flores fœminei distincti. Cupula ore aperta, squamis in lamellas concentricas vel subspirales integras vel sero crenatas lateraliter coalitis. Ovula supera.—In Asiâ meridionali.

V. CHLAMYDOBALANUS (Endl. Gen., anno 1847; sect. *Castanopsis*, Blume, Mus. Lugd., non *Castanopsis*, Don).—Inflorescentia et flores masc. *Pasaniæ* et *Cyclobalani*. Flores fœminei distincti. Cupula glandem undique tegens, sæpius apice irregulariter fissa (in eodem ramo clausa vel fissa), concentrice squamis connatis verticillatis cincta. Ovula supera.—In Asiâ meridionali.

This last section comes very near *Lithocarpus*, Blume, in which the acorn is said to be joined to the involucre, which covers it entirely. Next comes *Castanopsis*, Spach, with the inflorescence and flower of of those Oaks which are included in *Pasania* and the following sections, as well as the echinate fruit of *Castanea*, from which it differs by its 3-celled ovary. *Castanea*, with its 6–7-celled ovaries, and *Fagus*, are too well known to be mentioned here.

I have not admitted the genus *Synædrys*, Lindl., founded on the presence of incomplete partitions, which penetrate the spermoderm and cotyledons. This character, remarkably enough, exists in some Oaks (*Q. Skinneri*, from Mexico, *Q. cornea*, Lour., *Q. Korthalsii*, Blume, from the Indian Archipelago) which have nothing else in common, but is not found in those species which are most closely allied; besides, there are transitions in other species in the form of slight folds which scarcely penetrate, or as undulations of the cotyledons, and even in the species indicated the folds are irregular.

Q. virens, Ait. (*Q. oleoides*, Cham. et Schl.), a species of extensive range in the south of North America, offers a very singular character, but I do not yet understand either its value or its constancy. In the four seeds I have examined, the radicle is buried in the homogeneous firm substance, which represents either two combined cotyledons or a single cylindrical cotyledon. Its central position towards the upper part of the fruit indicates rather two intimately combined cotyledons. I have seen nothing like it either in *Q. Ilex*, the most nearly allied, or any other species. It will be interesting to examine the development of this seed, as I have been unable to learn anything further from the condition of the herbarium specimens at my command.

The greatest difficulty is how to divide *Lepidobalanus*, that natural section of the genus *Quercus* which alone contains more than half the species, some of which appear at first sight to differ much; for instance, *Quercus Robur*, *Cerris*, *Vallonea*, *Libani*, *rubra*, *Xalapensis*, etc. I wish I could have formed natural groups round these species which seem to have very marked characters, in other words, subsections analogous to the numerous ones into which Spach divides the subgenus *Lepidobalanus*, Endl. Webb, Endlicher, and especially M. Gay, have already attempted this, but I must say they have only reached a certain point, passing over a crowd of species from Mexico and southern or western Asia, which a few years ago were little known. M. Gay has

stated this with his usual candour,* and we may conclude that he thinks his own subdivisions are not likely to stand. The result of my own long study is, that in the present state of science the subgenus *Lepidobalanus* cannot be subdivided. When the male flowers of many species are better known, and the evolution of the buds has been examined, it may be possible to establish a truly natural division, but at present, with the help of fruit and leaves only, we cannot get beyond artificial sections, which frequently separate closely allied species.

The form and direction of the involucral scales is a character too subject to transition to be depended on, besides it sets aside some species like *Q. Cerris*, while removing many from it in one mass.

The duration of the leaves is considered by Webb and other authors to be variable in some species (*Q. Lusitanica*, *humilis*, etc.), and the character has the inconvenience of being ascertained with difficulty, both in herbaria and in travelling through a country. Webb considers the leaves of *Quercus* to be "deciduous," "subdeciduous," or "persistent," but this only indicates the inconstancy of the character. In many southern species, especially in the Mexican ones, it appears that the leaves fall in their second year shortly after the shooting out of the new leaves, and in this case are scarcely ever found on herbarium specimens, which are usually gathered in fruit in autumn. In general, whether leaves are very persistent is easily ascertained, but the distinction between leaves which fall a little earlier or a little later than the next leafing-season, is too liable to transition between species, and too transitory to be of practical use.

I am therefore obliged to divide the group *Lepidobalanus* almost artificially; first, from the duration of the fruit and position of the ovules, constant characters of some importance; then, from the duration of the leaves, a less determined and constant character. The result is as follows:—

§ 1. *Ovula abortiva infera. Maturatio annua.*

* Folia caduca: *Q. Robur*, *Toza*, *Lusitanica*, *alba*, *Prinos*, *macrocarpa*, *polymorpha*, etc.

** Folia persistentia: *Q. tomentosa*, *microphylla*, *virens*, *Ilex*, *Suber*, etc.

* Ann. des Sc. Nat., ser. iv. vol. vi. p. 238.

§ 2. *Ovula abortiva infera. Maturatio biennis.*

* Folia caduca: *Q. Cerris.*

** Folia persistentia: *Q. Pseudosuber, occidentalis, Vallonea, Libani, coccifera,* etc.

§ 3. *Ovula abortiva supera. Maturatio biennis.*

* Folia caduca: *Q. falcata, ilicifolia, rubra, Phellos, Xalapensis, calophylla,* etc.

** Folia persistentia: *Q. acutifolia, aquatica, Castanea, cinerea,* etc.

This last division comes near the other sections of the genus *Quercus,* but I repeat, that except this somewhat arbitrary arrangement of species in the principal section, all the other sections and genera are founded on a combination of characters and therefore truly natural.

REPORT FOR 1862 OF THE THIRSK BOTANICAL EXCHANGE CLUB.

By J. G. Baker, Esq.

As in previous years, I propose to offer, along with our annual list of desiderata, a few remarks relative to some plants passed through my hands during the past year,—as before, restricting the observations to a brief notice of plants of critical interest, and to species sent from provinces or subprovinces from which they are not registered in the 'Cybele Britannica.'

Capreolate Fumariæ.—Mr. A. G. More sends this year specimens of both *F. pallidiflora* and *F. muralis* from the Isle of Wight, his example of the latter being the first from this country I have seen; it agrees well with the Azoric plant of Mr. Watson, which Professor Boreau authenticated as true *F. muralis.* We are indebted this year to Mr. F. M. Webb for a good supply of *F. confusa* from Cheshire, the first specimens which the Club has had.

Fumaria media, Loisel.—Mr. Webb sends also, from the Cheshire side of the Mersey, a *Fumaria,* which, judging from the description and a specimen from Professor Boreau, is probably this plant. In habit of growth, Mr. Webb writes, it is more rampant than *F. officinalis,* thus showing an approach to the *Capreolatæ.* The petioles are several of them twisted; the leaves a pale glaucous-green; the seg-

ments of the lower leaves subspathulate and more divergent than is usual in *F. officinalis*; the spikes furnished with numerous flowers, some of them, when the plant is in seed, being fully two inches in length; the petals much paler than in ordinary *F. officinalis;* the sepals ovate-lanceolate, slightly toothed, narrower than the corolla, and an eighth of an inch in length; the fruit rugulose as in *F. officinalis* and similar in shape, that is, decidedly broader than long and depressed at the apex. Perhaps another year Mr. Webb may be able to procure further specimens of the plant and seeds for cultivation. The characters which separate it from *F. officinalis* seem to be of trifling value; and Miss Gifford sends from Somersetshire a plant with equally diffuse habit of growth and divergent leaf-segments, but with flowers almost or quite as deep in colour as in the usual forms of this latter.

Camelina sativa, Angl.—In the last edition of the 'Manual,' Professor Babington states that he has not met with *C. sativa*, Fries, in this country. I have gathered it in numerous stations in North Yorkshire, and have distributed, at different times, well-developed specimens through the Club; whilst, on the contrary, I have never gathered or seen British examples of *C. fœtida*. Under these circumstances, it may be worth while, though the plants are mere interlopers, for our members to examine their specimens with a view to ascertain which of the two their herbaria contain, and what has been their relative and absolute dispersion through Britain. *C. fœtida*, Fries, has inflated obovate-subglobose silicles, truncate at the apex; comparatively short styles; comparatively short and loose spikes of flowers, with the lower pedicels subpendulous in the mature plant; and entire, or dentate, or sinuate-pinnatifid leaves with acute auricles. I have it from Belgium and Germany. *C. sativa*, Fries Mant., has obovate, ventricose, but not inflated silicles, rounded towards the apex, and harder in texture than in *C. fœtida;* elongated and branched spikes of flowers, with comparatively short, patent or erecto-patent pedicels; and usually entire leaves with short auricles. *C. dentata* of Persoon is *C. fœtida; C. dentata* of Hornemann and the "Summa Vegetabilium" of Fries is *C. sativa*. *C. sylvestris*, Wallr., is a more slender plant than the other two, more rigid and more hairy, with a firm, often unbranched stem; firm, hard, pyriform silicles, rounded towards the apex, and with a more conspicuous margin than the other two; styles about half as long as the silicles; erecto-patent pedicels, and almost entire leaves. I have

not seen British specimens of this latter, but have distributed to the members several Belgian ones which Professor Crépin sent us, and it is very likely to be met with. Mr. A. G. More has sent this year Hampshire examples of *C. sativa*, and to this, I believe, must be referred all the British specimens distributed through the Club.

Barbarea intermedia.—I gathered this species in tolerable quantity, last summer, in a cultivated field at the foot of a hill called Easterside, at the southern end of a dale called Bilsdale, which runs for thirteen miles, from north to south, through the Oolitic hills of North-east Yorkshire. It is new to the county, and with us, as regards category of citizenship, is clearly either a Colonist or an Alien, not a Native in the sense in which the term is employed in the 'Cybele.'

Viola lepida, Jordan.—I gathered, in July, 1860, near the Spital of Glen Shee in Perthshire, a Pansy with the habit of growth of *V. tricolor*, but yet apparently with a perennial root, and growing in a station suitable for *V. lutea*, a meadow near the banks of a stream. The stem is nearly a foot in height, branching at the crown of the root, and as succulent and robust as in ordinary *V. tricolor*. The lower leaves are broadly ovate; the upper ones lanceolate; the lateral lobes of the stipules linear, erecto-patent, or slightly curved; the terminal lobe much larger than the others, somewhat leaf-like, entire or very slightly toothed. The lower peduncles are three times as long as the leaves; the sepals narrowed gradually, and conspicuously shorter than the petals; the upper petals broadly obovate in shape, a rich deep purplish-violet in colour, three-eighths of an inch broad, and more than half an inch deep from the apex to the throat; the middle pair somewhat narrower and paler; the lowest one considerably broader than the distance from its outer edge to its throat, bright-yellow within, with radiating lines the same colour as its outer portion; spur violet-coloured, blunt, exceeding the calycine appendages. This plant was submitted to Professor Boreau, and marked by him "Videtur *V. lepida*, Jordan." This is a plant described in Jordan's 'Pugillus,' and given there, with a mark of doubt, as a plant of Belgium. My plant agrees very well with the description, unless it be in the spur, which is stated to be "eximie patenti-deflexo." I wish any one who may have the opportunity would search this out and investigate it further. I brought home seeds and sowed them, but they did not come up next spring, probably because they were not ripe enough when gathered. It grows on the

north side of the stream, just above the bridge which is nearest to the Spital of Glen Shee. It evidently occupies, like *V. sabulosa* and *V. Curtisii*, an intermediate position between *V. tricolor* and *V. lutea*. Jordan compares it to *V. Vivariensis*, which is also a montane plant.*

Arenaria serpyllifolia, var. *Lloydii*.—Of the Isle of Wight plant mentioned in our Report of last year, Mr. Watson sends a supply of garden-grown specimens.

Geranium Lancastriense.—Mr. Watson sends for each of the members a specimen of this, fifty plants of which were all raised true from seed in his garden in 1861–62.

Lathyrus hirsutus.—Mr. W. Bennett, of Brockham, sends a garden-grown specimen of this very local species, from a root originally procured in the neighbourhood of Croydon. It is given as a doubtful inhabitant of Surrey in the Supplement to the 'Cybele.'

Rubus Bloxamianus, Coleman, in White's Hist. of Leicestershire.—The Rev. W. H. Purchas sends a bramble under this name, respecting which he writes,—"It is a plant which the Rev. W. H. Coleman has been accustomed to distinguish under the above name, and which he has frequently pointed out to me in this immediate neighbourhood (Calke, Derbyshire) and in the adjoining parts of Leicestershire. The points in which it differs from *R. Hystrix* are the peculiar clothing of the stem, the prickles passing abruptly into a dense even coating of setæ; the leaves, which are broader and less acuminate than in *R. Hystrix*, and more coriaceous in texture, convex above with impressed veins; the panicle, which is more compact; and the sepals, which are almost without the flattened and dilated point. Thus, on the whole, the differences are those which result from greater compactness of growth, and this habit is favoured by the plant preferring more exposed places of growth than *R. Hystrix* usually does." On this Mr. Coleman observes, "The real affinity of *R. Bloxamianus* is, however, with *R. Radula*, from which it differs in its prickles not passing gradually into setæ, and in the absence of the white under side of the leaves. If, as I sometimes suspect, it is a mere though well-marked variety, it must be called *R. Radula*, var. *Bloxamianus*."

Galium erectum.—Mr. Kirk sends specimens from Leek Wootton, in Warwickshire. It is given as a doubtful inhabitant of the Mid-Severn subprovince in Cyb. Suppl.

* Conf. 'Journal of Botany,' pp. 11, 12.

Erythræa latifolia.—Sent by Mr. A. G. More from Freshwater, in the Isle of Wight. In Cyb. Suppl. it is given only as a plant of the Mersey province.

Cynoglossum sylvaticum.—Mr. John Sim sends a number of specimens of this species from the neighbourhood of Perth.

Juncus diffusus.—Sent by Mrs. Hopkins from the neighbourhood of Bath. New to Somersetshire.

Carex teretiuscula.—Sent by Mr. A. G. More from the Isle of Wight. New to the Mid-Channel subprovince.

Carex distans.—Mr. A. G. More sends specimens from the Isle of Wight, respecting which he writes: "Of this I send you a series of specimens which have the glumes much less mucronate than usual. In some of the plants there is hardly one glume that can be called mucronate, others have mucronate glumes on the lower part of the spike only. All the books consulted insist on the mucronate glumes as an essential character, therefore I think the specimens worth examining." I find that in some of my own specimens the glumes pass from blunt to decidedly mucronate in the same spike.

Poa nemoralis.—Mr. A. G. More sends specimens of this species from the Isle of Wight, to the flora of which it is new.

Introduced Plants.—The following are the most noteworthy plants of the year that come under this category, viz.:—*Sisymbrium Pannonicum*, Crosby sand-hills, near Liverpool, the specimens gathered in 1858, the plant plentiful there for the last seven or eight years (H. S. Fisher); *Melilotus arvensis* and *M. parviflora*, both sent from Liverpool by Mr. Fisher; *Poa Sudetica*, from Kenilworth, in Warwickshire, probably introduced with foreign hay (T. Kirk); *Bromus tectorum*, Wandsworth, Surrey (Rev. A. M. Norman); *B. arvensis*, St. Margaret's, Kent (J. T. Syme); *Fumaria micrantha* and *Artemisia campestris*, both sent from the Hartlepool ballast-hills by Mr. Norman; *Eragrostis poæoides*, from a new-made road at Claughton, near Birkenhead (F. M. Webb); and *Phleum (Achnodonton) tenue*, a weed in a bed of onions in garden ground at Thirsk.

DIMORPHISM IN THE GENITALIA OF FLOWERS.

By Professor Asa Gray.

Two principal kinds of dimorphism in the genitalia of flowers have been noticed in a great number of instances, and put on record in various works; but the instances have not been collected and systematized, nor had the import of the most curious case been made out until elucidated by Mr. Darwin. There is, first, the dimorphism which Mr. Darwin has illustrated in his paper "On the two forms, or Dimorphic Condition, in the species of *Primula*." This was long ago named *diœcio-dimorphism* (see Flora of N. America, ii. p. 38, etc.), a name which pretty well expresses the thing as now understood; for these blossoms, although hermaphrodite structurally, are functionally as if diœcious or nearly so, the end subserved being fertilization of the ovules of one flower by the pollen of another flower on another individual.

The diœcio-dimorphous species of *Plantago* had seemed to confuse this case with the next; that is, the short-stamened flowers appeared to be fertilized in the closed flower, and the long-stamened and generally sterile plants therefore to be generally useless. This could hardly be; and a recent observation on a single specimen (likely to be confirmed in others) shows the top of the style projecting from the tip of the closed corolla. This refers the case to the same category with *Houstonia*, *Primula*, etc., to which *P. pusilla* and *P. heterophylla*, having the corollas of the short-stamened form open in anthesis and the stigma projecting, evidently belong. It is to be noted that dimorphism, both of this and of the following sort, is apt to be variable, either in mode or in degree, in different species of the same genus, and also that it seldom occurs in all the species of a genus, some of them being unaffected, while others in some genera are nearly polygamous or diœcious,—which is all very favourable to the conclusions that Mr. Darwin wishes to draw.

The second case, which equally belongs to structurally hermaphrodite flowers, is practically the reverse of the first. It is the case in which, besides the normal flowers of the species, which for the most part are rarely or sparingly fertile, other flowers are produced which never open, their development being as it were arrested in the bud, but which are

very prolific of seed. Here the stigma is, and must needs be, fertilized by pollen from the anthers of the same flower, the two being shut up together in the same closed bud. The acaulescent Violets and the common wild species of *Impatiens* are good examples of the kind. In fact, here impregnation is effected as it were in the early bud; wherefore we had indicated these as cases of *precocious fertilization.* Here the pollen is unusually active, sending out its tubes while still in the anther, and thereby, in *Impatiens*, etc., attaching the anthers to the stigma. In the first case, Nature takes great pains to secure the cross-fertilization of individuals of the species; in the other, on the contrary, she takes equal pains to secure self-fertilization. The end in the first case, as Mr. Darwin maintains (we believe upon good philosophical grounds, now in the course of vindication by experiment), is to ensure the perpetuation of the species, since close-breeding or continued self-fertilization tends to sterility, while wider breeding is recuperative. We leave it to Mr. Darwin's sagacity to ascertain the end in the opposite case, noting that here the most undoubted close-fertilization for infinite generations shows no apparent tendency towards sterility, but rather the contrary.

From another point of view which we are accustomed to take, however, we may suppose that as one result of the cross-fertilization must needs be to keep down variation by repeated blendings, so the design of close-fertilization may be to allow and to favour the perpetuation of varieties; self-fertilization, without selection, being just the condition which should most favour both the multiplication of new varieties and their preservation. That such would be the operation, as long ago expounded,* appears to us so clear, that we were somewhat surprised at finding that the reviewer of Darwin's *Primula* paper in the 'Natural History Review' (ii. p. 238) regards the separation of sexes, and therefore cross-fertilization, as favouring variation, and self-fertilization as necessarily inimical to it. This probably comes from not considering that while close-breeding tends to keep a given form true,—in virtue of the ordinary likeness of offspring to parent,—it equally and in the same way tends to perpetuate a variation once originated from that form, and also, along with selection (natural or artificial), to educe and further develope or confirm said variety. On the other hand, free cross-breeding of incipient varieties *inter se* and with their original types is

* 'American Journal of Science and Art,' vols. xvii. and xix.

just the way to blend all together, to repress all salient characteristics as fast as the mysterious process of variation originates them, and fuse the whole into a homogeneous form.

We will also remark (in reference to p. 236, line 31, and p. 238, line 3 *et seq.*, of the above-mentioned review) that the Chestnut does exhibit manifest rudiments of stamens in its pistillate flowers; also that, on morphological grounds, we should look upon hermaphroditism, rather than the contrary, as the normal or primary condition of flowers, and inquire how and why so many became diclinous, rather than "how and why they ever became hermaphrodite." Forms which are low in the scale as respects morphological completeness may be high in the scale of rank founded on specialization of structure and functions.—*From the American Journal of Science and Art*, xxxiv., *with corrections by the Author.*

CORRESPONDENCE.

Vegetation about Cape Arid, South-west Australia.

King George's Sound, January 31, 1863.

By the last mail-steamer I forwarded to Sir William J. Hooker a box containing some roots of the monster *Macrozamia*, which I procured at Cape Arid last November, and had conveyed to this place in a boat which happened to be on its way hither. I hope they will arrive safe and do well. I have made a trip to the Russell ranges, which bear about north from Cape Arid fifty miles, but on two occasions was compelled to retreat to the coast from want of water. I have not obtained many novelties, the country passed over being barren in the extreme, vegetation stinted, and no timber, only a patch of *Casuarineæ* of about twenty-five square miles. I was much disappointed, expecting to make a rich collection in a country where no collector had ever been.

GEORGE MAXWELL.

Explosion of the Pods of Acanthus mollis.

Rye Lane, Peckham, April, 1863.

All the circumstances that led to the production of so remarkable a work as Goethe's Essay on the Metamorphosis of Plants, a work much more talked about than known, have a special interest. I may therefore be allowed to call your attention to a passage from Goethe's history of his botanical studies, and which has also reference to the fact mentioned by Mr. Smith, at p. 74 of

the 'Journal of Botany,' as to the explosion of the fruits of *Hura crepitans*. "I had brought home some pods of *Acanthus mollis*, and had placed them in an open box. Some time afterwards I heard, in the middle of the night, a crackling, which was soon followed by the projection of a great number of little bodies against the walls and the ceiling. I could not at first understand what this could be, but I subsequently found my pods burst and the seeds scattered; the dryness of my room had in the course of a few days caused the development of the greatest amount of elastic force in these fruits."*

MAXWELL T. MASTERS, M.D.

Opening of Palm Spathes with an Audible Report.

Kew, April 5.

After drawing up the article in your Journal (p. 67), I learned some fresh facts connected with the flowering of the *Ptychosperma Cunninghami*, which tend to show that the explosion of the spathes being caused by an accumulation of heat thrown off by the developing anthers was after all not so improbable a suggestion. In the first place, however, I must acknowledge that I am indebted for these facts to Mr. Walker, the intelligent foreman of the Palm-house in the Royal Botanic Garden at Kew, who is a shrewd observer, and has been closely watching the flowering of this Palm for some time past.

The plant at Kew flowers frequently, and Mr. Walker informs me that the manner in which its spathes open is by no means regular. On some occasions the leaf, from the axil of which the inflorescence is produced, falls off at an early stage, so that the unopened spathe is exposed to view before it has reached its full size, and when this is the case both spathes split open gradually, without making any noise, and remain attached to the base of the peduncle for a considerable time afterwards. But at other times the leaf persists until the inflorescence is much more fully matured, and then both the leaf and the two spathes are forced off and fall to the ground together, just as they did upon the occasion when the report of the explosion was heard at Kew. It has been asserted by way of argument against the theory of heat being the cause of this explosion, that at the period of the bursting of the spathes the flowers are always closed, and in fact do not open until some weeks after; but although it is quite true that this is sometimes the case, it is not by any means invariably so. In those instances where the spathes open slowly, the flowers are certainly in a very immature state when the spadix is first set free, and do not open until they have been exposed for some two or three weeks; but in the other cases, that is, in those in which it is presumed that the spathes open suddenly, at least two-thirds of the male flowers are fully developed and partially open when the spathes burst. From this it will readily be seen that it is quite possible that the anthers may give off heat during the time the spadix is enclosed in the spathes, and in the event of an accumulation of this heat taking place, the

* 'Œuvres d'Histoire Naturelle de Goethe,' etc., traduits par C. F. Martins, p. 205. Paris, 1837.

air confined within the latter would ultimately expand to such a degree that their rupture would be a necessary consequence; and as both these organs in this particular Palm are entirely closed, and of a rather tough papery texture, a considerable report might possibly occur. The female flowers do not open until some time after the male, and this circumstance accounts for the Kew plant never having produced perfect fruits. Indeed it would seem that in our hothouses monœcious Palms not unfrequently fail in this respect, even when both sexes of flowers are, as in the case of this species, upon the same spadix. Mr. M'Nab writes me that the plant of *P. Cunninghami* in the Palm-house at Edinburgh flowers frequently, but produced perfect fruits upon one occasion only, and that in abundance; and in this instance the fruits were scarcely half an inch in diameter and of a *dark-brown* colour when ripe, not red, as those of *P. Seaforthia* in Bauer's drawing. As an instance of the uncertainty connected with the fruiting of Palms, he also informs me that the large plant of *Euterpe montana*, Grah., at the same place, produced fruit abundantly about fifteen years ago, and, although it has since flowered regularly every year, it has never again ripened fruit fit for germination till the present year, when two large clusters were produced.

ALEXANDER SMITH.

Popular Names of British Plants.

Worcester, April 4, 1863.

Possibly the following explanation of the word "March" may be of some use to Dr. Prior. *March*, in the Welsh language, signifies a horse. It is prefixed to several botanical names in their herbals, such as *March-fint* (Horse Mint), *March-ffenigl* (Giant or Horse Fennel), *March-ys-gallen* (*Carduus lanceolatus*), and others which it would be tedious to enumerate, but they all imply the qualities of strength and size. "Fat Hen" (*Chenopodium Bonus-Henricus*) was in use formerly, intermixed with other food, to feed poultry, who throve upon it: hence the reason of the name.

A SUBSCRIBER.

[It is an objection to "A Subscriber's" derivation of "March" from the Welsh, that the same word, with allowance for dialectic differences, occurs in Continental Germanic languages which have had no contact or connection with the Welsh, as *e.g.* in the German Wasser-*merke*; Danish, Vand-*merke*. In Anglo-Saxon it is called *merce*, *meric*, and *merici*. The remarks on "Fat Hen" seem to explain the name satisfactorily; but this use of the plant is equally unnoticed in foreign as in English works, and the name was originally given to the Orpine (*Sedum Telephium*), as is the corresponding German name, *Fette Henne*, at the present day.—ED.]

Dr. Nylander's Criticisms on Mudd's 'Herbarium Lichenum Britannicorum.'

Great Ayton, Stokesley, Yorkshire, April 14, 1863.

Whilst I feel most grateful to Dr. Nylander for pointing out, in the Ratisbon Flora, the discrepancies and errors in the 'Herbarium Lichenum Britannicorum,' fasc. i.–iii., I cannot but deplore the condemnatory manner in which these reputed errors have been exhibited. On the face of his assertions there is displayed an accusation of gross ignorance and negligence on my part, and an exhibition of critical accuracy on his. The principal object of the *above work*, and of the 'Manual of British Lichens,' was to incite a more critical study and examination of the species of this country, concluding that, if such object could be accomplished, the interchanging of opinions respecting doubtful species, their classification, etc., would naturally follow, and materials would be collected from which ultimately a work might be produced critically correct. I never anticipated that this exchanging of opinions would be conducted in any other than in the most amicable manner. To analyse or investigate the assertions of others is right, and, if error is detected, let the investigator give to the world the result of his investigations; but let this be done in a dispassionate and unbiassed mode, and then it will leave a benefit behind. Criticism is a correct path to truth, as well as an excellent mode of elucidating obscure or ambiguous reasoning; but criticism for the mere sake of criticism is nothing more than the employment of talent for the self-aggrandisement of the critic.

Allow me, in the first instance, to introduce Dr. Nylander's observations on fasciculi i.–iii. of my 'British Lichens:'—

"1. *Collema pulposum* is *C. pulposum*, var. *tenax*, Ach., approaching *limosum*, Ach.

4. *Leptogium tenuissimum* is *L. spongiosum*, Nyl.

10. *Cladonia gracilis*, var. *hybrida*, is *C. gracilis*, f. *chordalis*, Flk. 11 is the same, 'sterilescens spermogonifera.'

12. *Cladonia degenerans* is *C. crispata*, Ach., *spermogonifera*.

16. *Cladonia furcata*, var. *racemosa*, is *C. furcata*, var. *pungens*, Ach.

17. *Cladonia furcata*, var. *pungens*, is *C. uncialis*, var. *bolacina*, Ach.; 18 is the same in various forms.

23. *Cladonia coccifera*, var. *bellidiflora*, is *C. macilenta*, var. *corcata*, Ach.

24. *Cladonia Flœrkeana* is like *C. macilenta*, var. *corcata*, Ach.

26. *Cladonia digitata* consists of various forms of *C. macilenta*, Hoffm.

36. *Usnea barbata*, var. *plicata*, is *U. ceratina*, Ach.

55. *Cetraria glauca*, var. *fallax*, is *Platysma ulophyllum*, Ach.

58. *Peltigera aphthosa* is *Peltidea aphthosa*, var. *leucophlebia*, Nyl.

61. *Peltigera polydactyla* is *P. polydactyla*, var. *hymenina*, Ach.

66. Is *Parmelia sulcata*, Tayl.

71. *Parmelia aleurites* is *Parmeliopsis placorodia*, Ach., Nyl.

72. *Parmelia olivacea* is *P. exasperata*, Ach.

81. *Borrera obscura*, var. *chloantha*, is *Physcia stellaris*, f. *rosulata*, Ach.

82. Is *venusta*, Ach.

86. *Physcia parietina*, var. *laciniosa*, is *P. parietina*, var. *polycarpa*, Ehr.

91. *Squamaria crassa* is *S. crassa*, f. *melaloma*, Ach.

103. *Lecania cærulescens* is *Lecanora athrocarpa*, Dub., *saxicola*.

108. *Rinodina metabolica* is *Lecanora sophodes*, var. *teicophila*, Nyl. Spores 0·023–27 millim. long, 0·012–14 millim. broad.

111. *Lecanora atra* is *L. subfusca*, var. *coilocarpa*, Ach.

128. *Lecanora varia*, var. *denigrata*, is *L. varia*, var. *sepincola*, Ach., Nyl. Scandinav. p. 164.

142. *Psora Caradocensis* is *Lecidea Friessi*, Ach.

150. *Bacidea luteola*, var. *cæsio-pruinosa*, is *Lecidea luteola*, **poliæna*, Nyl. Scand. p. 208.

154. *Bilimbia sphæroides* is *Lecidea sabuletorum*, Flk.

155. *Bilimbia anomala* is *Lecidea tricolor*, Wither., Nyl. Scand. p. 201.

162. *Lecidea conglomerata* is *L. vernalis*, Ach., f. *corticalis*, Nyl. Scand. p. 201.

163. *Lecidea minuta* is *L. tenebricosa*, Ach., Nyl. Scand. p. 201. Spores 0·009–0·018 millim. long, and 0·0045 broad.

175. *Lecidea aggregata* is *L. incincta*, Nyl. Scand. p. 231.

178. *Lecidea lapicida* is *L. lithophila*, Ach., Nyl. Scand. p. 226.

180. *Lecidea contigua*, var. *confluens*, is *L. contigua*, typical enough.

185. *Buellia coracina* is *Lecanora sophodes*, var. *lævata*, Nyl. Spores about 0·014 millim. long, 0·007 millim. broad.

186. *Buellia verruculosa* is *Lecidea ocellata*, Flk. (*Rinodina sulphurea* Lönur, in Flora, 1858, p. 611.)

194. *Diplotomma calcareum* is *Lecidea umbilicata*, Ram.

203. *Opegrapha Chevalieri* is *O. confluens*, Ach.

213. *Opegrapha rubella* is *O. viridis*, Pers., Nyl. Scand. p. 256.

215 and 216. *Stenographa anguina* is *Graphis sophistica*, Nyl.

228. *Arthonia astroidea*, var. *Swartziana*, is *A. astroidea*, f. *obscura*, Ach. 229 is typical *A. astroidea*.

230. *Arthonia astroidea*, var. *epipasta*, is *A. astroidea*, var. *epipastoides*, Nyl. Scand. p. 259.

231. *Arthonia punctiformis* is *Mycoporum miserrimum*, Nyl.

265. *Pertusaria pustulata* is *P. leioplaca*, Ach."

Now, Sir, in vindicating my own reputation as a lichenist, I trust you will permit me to reply, one by one, to these alleged errors.

1. *Collema pulposum*, Mudd. *C. pulposum*, var. *tenax*, Ach. Probably correct. I place very little dependence on the *colour* of the *thallus* of *C. pulposum*, or of any its varieties. They are all more or less affected, both in luxuriance and colour, by local circumstances.

4. *Leptodium tenuissimum*, Mudd. *L. spongiosum*, Nyl. There is no error here! A glance at the synonyms in the Manual, page 46, will show that I was quite aware that he regarded it as *L. spongiosum*. It is not *Lichen spongiosus*, Sm. Eng. Bot. 1374, as stated by him in his Syn. Meth. Lich. 119.

10, 11, 12, 16, 17, 18, 23, 24, 26. The whole of these are identical with authentic specimens issued by *Schærer*, *Hepp*, and *Leighton*; and if their names are erroneous, I am not answerable for them.

36. *Usnea barbata*, var. *plicata*, Mudd. *U. ceratina*, Nyl. *U. ceratina* and *U. plicata* pass into each other, and are not at all times distinguishable, and I may have confused them.

55. *Cetraria glauca*, var. *fallax*, Mudd. *Platysma ulophyllum*, Nyl. Some mistake here. I presume No. 56, *Cetraria sepincola*, will be the plant intended. *C. ulophylla*, Ach., is a luxuriant state of *C. sepincola*, having the margins of the lobes more or less crisped and white-sorediiferous. It is not sufficiently distinct to deserve a separate name.

58. *Peltigera aphthosa*, Mudd. *P. aphthosa*, var. *leucophlebia*, Nyl. I am unable to find any *permanent characters* whereby to distinguish this from the ordinary form.

61. *Peltigera polydactyla*, Mudd. *P. polydactyla*, var. *hymenina*, Nyl. The different appearances which *polydactyla* assumes arise chiefly from local circumstances, and are far too fugitive to be worthy of separate names.

66. *Parmelia saxatilis*, var. *leucochroa*, Mudd. *P. sulcata*, Nyl. Yes! See Manual, page 95.

71. *Parmelia aleurites*, Mudd. *Parmelia placorodia*, Nyl. This is not an error! The species sent out by me is the *Lichen aleurites*, Sm. E. Bot. 858, and the *Parmelia aleurites* of authors, Acharius excepted.

72. *Parmelia olivacea*, Mudd. *P. exasperata*, Nyl. This is only an isidiiferous state of *olivacea*, and unworthy of a separate name even as a variety. If such trivial characters are to be regarded as distinctive, then species and varieties may be multiplied without end.

81. *Borrera obscura*, var. *chloantha*, Mudd. *Physcia stellaris*, var. *rosulata*. Nyl. The specimens in my copy of Schær. L. H. 353, are identical with those sent out in the H. L. B.; nevertheless I believe Dr. Nylander is correct.

82. *Borrera pulverulenta*, Mudd. *Physcia venusta*, Nyl. I can hardly recognize this, even as a variety. Intermediate states are of common occurrence. Its chief character is the absence of pruina on its thallus.

86. *Physcia parietina*, var. *laciniosa*, Mudd. *P. parietina*, var. *polycarpa*, Nyl. According to Schærer, L. H. 381! I am right.

91. *Squamaria crassa*, Mudd. *S. crassa*, var. *melaloma*, Nyl. The characters of this variety are too feeble and inconstant to admit its claim to distinction.

103. *Lecania cærulescens*, Mudd. *L. athrocarpa*, var. *saxicola*, Nyl. I have not the means at present of testing this assertion.

108. *Rinodina exigua*, var. *metabolica*, Mudd. *L. sophodes*, var. *teicophila*, Nyl. *R. sophodes* is a distinct species, having sixteen spores in each ascus, the plant sent out by me as "*metabolica*" has only eight. It is not, however, *metabolica*. What it is at present I cannot ascertain.

111. *Lecanora atra*, Mudd. *L. subfusca*, var. *coilocarpa*, Nyl. From the close resemblance of this variety to *atra*, I fear I have mixed them.

118. *Lecanora varia*, var. *denigrata*, Mudd. *L. varia*, var. *sepincola*, Nyl. The specimens in Schœr. L. H. 327! are identical with mine; but Dr. Nylander may be correct.

142. *Psora Caradocensis*, Mudd. *Lecidea Friesii*, Nyl. Another name for the same plant.

150. *Bacidia luteola*, var. *cæsio-pruinosa*, Mudd. *Lecidea luteola*, var. *poliæna*, Nyl. I named this plant in 1856, and cannot understand on what grounds he construes it into an error. The name *cæsio-pruinosa*, however, will in the future have to give place to that of *Bacidia stenospora*, Hepp.

154. *Bilimbia sphæroides*, Mudd. *Lecidea sabuletorum*, Nyl. This is not strictly an error. See the synonyms in Manual, p. 187.

155. *Lecidea anomala*, Mudd. *L. tricolor*, Nyl. I cannot agree. See Manual, pp. 176 and 185.

162. *Lecidea conglomerata*, Mudd. *L. vernalis*, var. *corticalis*, Nyl.

163. *Lecidea minuta*, Mudd. *L. tenebricosa*, Nyl.

Neither of these are strictly errors. They are the plants of the authors quoted.

175. *Lecidea aggregata*, Mudd. *L. incincta*, Nyl. I named this plant in 1858, and cannot see where I have erred. Dr. Nylander's *L. Scand.* was not published until 1861.

178. *Lecidea lapicida*, Mudd. *L. lithophila*, Nyl. According to Leighton's Exs. 157!, on which I placed great confidence, I have not erred in quoting Fries. The species which that gentleman regarded as *L. lapicida* consists of two forms, which have been described as distinct, viz. *L. polycarpa*, Flk., and *L. lithophila*, Ach.

180. *Lecidea contigua*, var. *confluens*, Mudd. *L. contigua*, Nyl. Here I have erred.

185. *Buellia coracina*, Mudd. *L. sophodes*, var. *lævata*, Nyl. I cannot possiby agree to this.

186. *Buellia verruculosa*, Mudd. *Lecidea ocellata*, Nyl. Another name for the same plant.

194. *Diplotomma calcareum*, Mudd. *Lecidea umbilicata*, Nyl. Here I am in error. All the specimens sent out by me, previous to 1863, as *calcareum*, are more or less mixed with what Dr. Nylander now calls *umbilicata*. Is *L. umbilicata*, Ram., synonymous with *Lichen spireus*, Sm. E. Bot. 1864?

203. *Opegrapha Chevalieri*, Mudd. *O. confluens*, Nyl. I have apparently mixed these.

213. *Opegrapha rubella*, Mudd. *O. viridis*, Nyl.

215 and 216. *Stenographa anguina*, Mudd. *Graphis sophisticata*, Nyl.

These are only other names for the same plants.

228, 229, 230, 231. Probably he is correct in these.

265. *Pertusaria pustula*, Mudd. *P. leioplaca*, Nyl. According to Leighton, I am correct.

Notwithstanding the critical acumen which Dr. Nylander has displayed in discovering what he deems "serious errors," perhaps you will kindly allow me to point out two or three others which have apparently evaded his microscopic examination, viz. :—

140. *Gyalecta truncigena*, and 284, *Thelidium conoideum*. These are both, more or less, mixed with *Gyalecta Flotovii*, Kbr., and *Thelidium Salweii*, Leight.

136. *Aspicilia ochracea* is *A. flavida*, Hepp. Schærer has apparently sent out two plants under the name *ochracea*. The specimen in my copy of his L. H. 128! I understand, is *flavida*.

In conclusion, I beg to thank you for affording me the opportunity of openly expressing my opinions on the reputed errors, and I trust that it will be received generally with the same good feeling as that with which it is dictated. Should there be any other *real error* detected in my works by contemporary lichenists, I shall feel obliged, for my own, as well as for the sake of science, if they will at once communicate it to me.—Yours, etc.

W. MUDD.

NEW PUBLICATIONS.

North Yorkshire: Studies of its Botany, Geology, Climate, and Physical Geography. By John Gilbert Baker. With four Maps. 8vo. London: Longman. 1863.

Mr. Baker is favourably known to British botanists by his 'Supplement to Baines's Flora of Yorkshire,' and his pamphlet on the 'Geognostic Relations of the Flowering Plants and Ferns of Great Britain;' also by numerous papers in botanical journals upon critical British botany. The present work will not merely preserve that reputation, but extend it. After an introduction explanatory of what is meant by North Yorkshire, he divides his book into three parts, treating severally (1) upon the Geology, Climatology, and Lithology, (2) the Topography and Physical Geography, and (3) the Botany of the district. The geological essay is well executed, and conveys a clear view of the structure of the country, one of much interest to the students of that science; but it is only incidentally that it concerns the objects treated of in our Journal. The climatology and lithology will be read with pleasure by botanists (if such there be) who do not care for geology. A full account is given of the climate and its apparent causes; especially noticing the effects of the presence of two ranges of lofty hills forming the eastern and western parts of North Yorkshire. We have been much interested by the statements concerning the elevations at which particular crops can be grown with advantage, and of the plants grown most successfully in the more elevated gardens. The highest Hawthorn hedge is at about 350 yards of elevation above the sea; but such fences are comparatively rare above 200 or 250 yards. Wheat is very little grown at above 200 yards of elevation; the highest field of that grain known to the author was a little under 300 yards, above which level it so rarely

succeeds as not to be worth growing. Oats are grown on the Hambleton plateau at 350 yards, and produce moderate crops, as is also the case with barley; but they occasionally fail altogether at that elevation. The highest garden is at 350 yards, where apples, gooseberries, cherries, raspberries, currants, and strawberries are grown; also carrots, turnips, beans, peas, potatoes, cabbage, cauliflower, and broccoli are planted. The apple and cherry trees grow vigorously, but do not fruit freely at that place. There is one small patch of land enclosed from the moor at an elevation of 533 yards, where potatoes, common rhubarb, cabbages, turnips, onions, cress, and *Sinapis alba* have been cultivated: from the past tense being used, we presume that the success attained did not encourage a continuation of the attempt at their production.

In the chapter on lithology, the effects of Eugeogenous (plentiful-detritus-bearing) and Dysgeogenous (sparing-detritus-bearing) districts upon the vegetation are largely and ably discussed. The results are shortly given:—

"To sum up, then, the bearings of the subjacent rocks upon the topography of our North Yorkshire vegetation, as tested by a comparison of the distribution of species within our limits and in the country respecting which M. Thurmann treats, we may say—

"1. As compared with the flora of Central Europe, the flora of North Yorkshire is one of a predominantly damp-loving stamp.

"2. The species which in Central Europe are restricted to dysgeogenous tracts only occur in North Yorkshire in small number, and are there restricted lithologically in a similar manner.

"3. The species which in Central Europe are restricted to eugeogenous tracts are many of them plants of North Yorkshire also: and under the more boreal and more humid climate grow abundantly and cover wide areas of surface, without keeping up any clearly-marked *rôle* of lithological restriction.

"And this shows us clearly that the nature of the subjacent rock both may and does interfere to modify the influence of atmospheric climate upon plant-topography, and it points out also in what direction the interference operates. A more porous and more humid soil evidently to some extent compensates for a drier climate. In proportion as the climate is damper, the characteristically dry-loving species are more and more rigidly restricted to dry-soiled tracts of country. This is the rule, and in botanico-geographical considerations it is evidently worth bearing in mind; but to what extent it has operated in determining which species we should have and which we should not have either in North Yorkshire or in Britain as a whole,—to what extent it has, for instance, operated in the restriction to the area which they occupy in our country of the plants of Mr. Watson's Germanic type of distribution,—we can but guess vaguely."

Part the second describes in detail the topography and physical geo-

graphy, and illustrates it largely by lists of plants peculiar or characteristic of the several spots noticed. We have not space to transfer these interesting remarks and lists to our pages, but feel sure that our readers will peruse them with much pleasure in the book itself.

Part the third, Botany, is a complete and elaborate local flora of North Yorkshire. The country is divided into nine districts, and the plants of each of them are recorded in the same manner as in the Floras of Hertford, Cambridgeshire, and Essex. Mr. Baker endeavours to decide the claims of the plants to be considered as (1) natives, (2) colonists, (3) denizens, and (4) aliens, and add a few (5) as incognita. We doubt the possibility of doing this to any great advantage, even after the labours of Mr. Hewett Watson with that object. The author seems to have followed the teaching of that eminent botanical geographer with as much success as could be expected. It is probable that the classes used in some other books may be better, as not attempting quite so much, viz. (1) native, (2) possibly introduced, (3) probably introduced, and (4) certainly introduced. But even on the latter plan the cases where persons will differ as to the position held by plants are very numerous. The range in altitude through which each plant is found seems to have been carefully observed, and forms an interesting feature in the work. The country is well suited for it, the stations extending from the level of the sea to an elevation of 2580 feet. The number of species of flowering plants, Ferns, *Equisetaceæ*, and *Lycopodiaceæ*, is summed up as follows :—

"Classifying the plants of North Yorkshire according to their categories of citizenship, as in the list now completed, we obtain the following result :—

Natives	872
Colonists	84
Denizens	36
Aliens	163
	1155

"Of the 992 species of the three higher grades of citizenship, 948 are ascertained as plants of the Lower, 413 of the Middle, and 126 of the Upper zone. A more detailed classification of the species according to their altitudinal range will be found at p. 188 ; and an attempt at a classification of the native species according to the plan of their distribution in North Yorkshire will be found at p. 91. Arranging the 992 species according to the "types of distribution," with regard to Britain as a whole (see p. 190), under which they fall, we obtain the following result :—

British	type	526	species.
English	"	301	"
Scottish	"	44	"
Highland	"	32	"
Germanic	"	38	"
Atlantic	"	7	"
Intermediate		33	"
Local	"	11	"
	Total	992"	

The book concludes with a similar account of the Mosses.

We have hardly any criticisms to make, but may remark that the author seems too much given to use hard terms in the place of simple ones. Why speak of montane, sylvestral, pratal, pascual, ericetal, uliginal, agrestal plants, rather than the more usual English forms of mountain, wood, meadow, pasture, heath, bog, and field plants? We do not see any benefit attending the change to compensate for it. But we are not inclined to take the ungracious trouble of picking holes in a book which we can most cordially recommend.

BOTANICAL NEWS.

The first part of Bentham's Flora of Australia is going through the press.

The University of Zurich has conferred upon Mr. Moore, Curator of the Glasnevin Botanic Garden, the degree of Ph.D., for his communications to the advancement of natural science.

Of Dr. Seemann's 'Popular History of the Palms' a second German edition has just appeared at Leipzig (Engelmann). Unlike the English one, it is in octavo, and illustrated by woodcuts instead of tinted lithographs. This new edition has been brought up to our present state of knowledge, and has been considerably augmented. In the appendix will be found an able treatise, by Hahmann, on the Palm-worship of the ancients, which caused some sensation amongst philologists and Biblical critics of the Continent when it first appeared in the 'Bonplandia;' also an enumeration of all the Palms at present known, and much more complete than that given in Walpers' 'Annales.'

The Directorship of the Botanic Gardens at Hamburg, vacant by the death of Professor Lehmann, has not yet been conferred upon any of the numerous applicants for it. In the long list of candidates we notice, amongst a host of obscure names, several men well known in this country, viz. Schleiden, Reichenbach fil., Sonder, and Karsten. Reichenbach possesses, besides personal qualifications of a high order, the largest private herbarium in Germany; and in a great city like Hamburg, which has no public collections of dried plants, this circumstance is likely to influence those with whom the appointment finally rests.

On March the 25th, Mr. Clements R. Markham read, at a meeting of the Society of Arts, an interesting paper on the "Supply of Quinine and the Cultivation of Chinchona Plants in India," which gave rise to an animated discussion, in which Messrs. J. E. Howard, Daniel Hanbury, B. Seemann, P. L. Simmonds, Gerstenberg, Samuel Howard, King Chambers, Munro, etc., took part. A report of the meeting will be found in No. 540 of the 'Journal of the Society of Arts.'

We are sorry to record the deaths of two naturalists, whose memories ought not to pass away without notice here. The Rev. W. L. P. Garnons, Vicar of Ulting, Essex, who died on March 5th, will be best remembered as a University preacher; but he did much for botany, and other branches of natural history, when that meant more than it does now. The Rev. W. T. Bree, M.A., forty years rector of Allesley, who died on February 25th, aged 77, during his long life did very much to make natural science popular. His papers in such journals as Loudon's 'Magazine of Natural History,' or Newman's 'Phytologist,' were excellent of their kind, and full of good feeling. His discovery of *Lastrea æmula*, which from the first he distinguished from its allies, is alone enough to show his position as a botanist. He was early aware of the importance of comparing natural history calendars, and became perhaps as much impressed as any one of his time with the distinction between truly native and only naturalized plants. Some papers by him in the 'Saturday Magazine,' we know, made several pupils in one school eager to be botanists, and his writings as a whole have probably had a greater share in the present tendency to make natural science popular than can be easily estimated now. We have not space to mention separately his numerous contributions, but are sure that, if they represent Mr. Bree correctly, entomologists, botanists, and parishioners will long lament this most amiable man.

Dried Plants for Sale.—Dr. Rostan, an excellent botanist, residing at Perrier, in one of the Vaudois valleys, who, besides numerous other additions to the flora of Piedmont, has rediscovered several plants not known to botanists since the time of Allioni, proposes to publish a collection of two hundred species of dried plants, to include the greater part of the rare and less-known species of western Piedmont. In the list will be found *Arabis Pedemontana*, Boiss., *Isatis alpina*, All., *Dianthus furcatus*, Ball., *Cerastium lineare*, All., *Trifolium Pannonicum*, L., *Ribes purpureum*, Rost., *Saxifraga Valdensis*, DC., *Centaurea Kotschyana*, Heuff., *Campanula elatines*, L., *Gentiana Rostani*, Reut., *Veronica succulenta*, All., *Allium Valdensium*, Reut., and many other very rare species. The parcels will be carefully made up, the specimens well dried, and several will be given of each of the smaller species. The price to subscribers who send their names to Dr. Rostan before the 1st of August, 1863, will be 40 francs = 32*s*.; price to non-subscribers, £2: in each case exclusive of carriage. Address applications, post-paid, to Dr. Rostan, Perrier, *viâ* Pignerol, Piedmont. It will facilitate the transmission of the parcels if each applicant will give an address in London to which they may be forwarded.—J. B.

Errata.—Page 72, line 11 from above, *read* "one and a half degree" *instead of* "half a degree;" page 84, line 13 from below, *read* "latter" *for* "lake."

Fig 4
Fig 5
Fig 6

ON THE NARDOO PLANT OF AUSTRALIA.

By Frederick Currey, M.A., F.R.S.

(Plate VI.)

The plant to which the present paper relates has acquired a special and melancholy interest from its connection with the fate of the unfortunate men who died of starvation on their homeward journey, after having safely traversed the continent of Australia, from Melbourne to the Gulf of Carpentaria. The expedition left Melbourne on the 20th of August, 1860, and reached Menindie, on the river Darling, towards the end of September. On the 11th of November they arrived at Cooper's Creek, a sort of inland lake or watercourse, about 400 miles north of Menindie. Here a depôt was formed and left in charge of some of the party, whilst Messrs. Burke, Wills, King, and Gray proceeded northwards. Gray died on the return journey, about four days before the party arrived at Cooper's Creek; and when Burke, Wills, and King reached that place, on the 21st of April, 1861, they had the mortification of finding that the party in charge of the depôt had left it that very morning. In a state of great exhaustion, Burke, Wills, and King determined on going south-west towards Mount Hopeless, a point not far from Mount Searle, one of the South Australian police-stations. In Mr. Wills's diary, under the date of Tuesday, May 7, 1861, is an entry that on that day they fell in with some blacks who were fishing, and he then adds: "They gave us some half-a-dozen fish each for luncheon, and intimated that if we would go to their camp we should have some more, and some bread. . . . On our arrival at the camp they led us to a spot to camp on, and soon afterwards brought a lot of fish and bread, which they call nardoo. . . . In the evening various members of the tribe came down with lumps of nardoo and handfuls of fish, until we were positively unable to eat any more."*

Some doubt still exists as to the plant from which the "nardoo" above referred to was obtained. It is a kind of flour procured by pounding the sporocarps or fruit of some species of *Marsilea*, but the particular species is at present not satisfactorily ascertained. King, the

* The above short details are taken from the account of the expedition, by Mr. Andrew Jackson, published by Smith and Elder in 1862.

survivor of the party, brought with him to Melbourne a number of the nardoo fruits, some of which came into the possession of Dr. Moore, of Glasnevin; and a few (five only), also gathered by King, reached Dr. Hanstein, of Berlin.

The exploration party by whom King was rescued collected the nardoo fruits on the spot where Mr. Burke died, and these latter fruits were received by Sir William Hooker through Captain Washington, the hydrographer of the Admiralty. The experiments and observations of the above-named eminent botanists have not yet solved the question as to the species to which the Nardoo plant belongs, there being no doubt that it is some kind of *Marsilea*. In the last part of his work on "Garden Ferns," Sir William Hooker gives a description of the nardoo fruits received by him. He considers them to be the produce of a *Marsilea* figured in his 'Icones Plantarum' (t. 909), under the name of *Marsilea macropus*, of which the following is the description:—

MARSILEA *macropus*, Hook.—Leaves peltate, quaternate, and, as well as the elongated petioles, sericeo-tomentose, leaflets broad-cuneate, erose at the apex; peduncles subradical, elongated, two inches long; capsules obliquely ovate, densely and obliquely sericeo-strigose, transversely but obliquely more or less distinctly marked with lines, and gibbous at the base or on one side; caudex creeping, branched.

Sir William Hooker adds, that *M. macropus* differs from *M. quadrifolia* in its larger size, and the remarkably long stalk to the fruit; but he thinks it probable that it may not be distinct, as aquatic plants, he says, vary so much.

Through the kindness of Dr. Moore, who has been highly successful in the treatment of the sporocarps (or fruits) which came to his hands,* I am in possession of a vigorous plant raised from one of those sporocarps, and which has been growing in my window under a bell-glass, in a pot in which the soil is kept moist. This plant is represented in Pl. 6, fig. 1, somewhat reduced, the real height of the largest frond being just over one foot. It will be seen by comparing this figure with the plate in Sir William Hooker's 'Garden Ferns,' or with that in his 'Icones Plantarum,' that the plant, irrespective of its fruit, which has not yet been produced, comes very near to *Marsilea macropus*, Hook. The leaflets of the latter are described by Sir William

* The 'Gardeners' Chronicle' of August 30, 1862, contains a paper by Dr. Moore, in which, amongst other very interesting matter, he states the method adopted by him for raising the young plants.

Hooker as "villous with dense silky hairs, especially beneath, and the hairs often deciduous above and occasionally beneath, subulate, articulated, tawny." This description is exactly applicable to the plant in my possession, except that I have not observed the hairs to be deciduous beneath, and the hairs are white, not tawny. The colour of the hairs may, however, vary with the age of the plant. There is a further slight difference in the circumstance that the leaflets of Dr. Moore's plant, when full-grown, are not at all, or very slightly, erose at the apex, although they are remarkably so in the young state.

I have stated that Dr. Moore's plant has not yet produced fruit. If the fruit should differ materially from that of *M. macropus*, such difference would be of importance; but Dr. Moore tells me that, according to his recollection, the sporocarps from which his plants were raised had a hairy outer coat, and thus far, therefore, it would seem that the Nardoo and *M. macropus*, Hook., are identical. But the paper published by Dr. Hanstein in the 'Monatsberichte' of the Prussian Academy for February, 1862, gives a different aspect to the question. Dr. Hanstein draws the following distinctions between the sporocarps in his possession and those of *M. macropus*. The fruits of *M. macropus*, he says, are broadly four-sided, having one side entirely occupied by the raphe; they have a shortly prominent apex, and are characterized by dense adpressed hairs. The Nardoo sporocarps, on the other hand, are much smaller, almost half-moon-shaped, obtuse, entirely bald, furnished with many manifest ribs, with two short teeth at the suture. He adds, that the Nardoo will probably prove to be a new species; and that he considered it desirable to give a description, even although the full characteristics were not then known. That description is as follows:—

MARSILEA *salvatrix*, n. sp.—Receptaculum pedunculatum, plane calvum, compressum, oblique curvato-oblongum, obtusum, fere duplo longius quam latum; raphe brevissima (vix lineam dimidiam longa) dentibus duobus acute prominentibus terminata; linea dorsalis leviter incurvata, ventralis valde convexa; acumen obtusum, oblique productum, versus dorsum spectans; valvæ conspicue 10–12-costatæ, costis aliis transverse continuis aliis in media valva furcatim alternantibus; sori utrinque 8–10; macrosporangia in quovis soro 5–10, microsporangia multo crebriora, minora, ovata aut obovata, ea ubique arcte circumdantia; pedunculus 9''' æquans (superans?); receptaculum 3–3½''' longum 2''' latum, cinereo-fuscum; caules et folia adhuc ignota.

If, therefore, any reliance were to be placed upon the hairiness or

smoothness of the fruit (for the other characters alluded to by Dr. Hanstein are of less importance), Dr. Hanstein's sporocarps might have belonged to a different species. Through the kindness of Sir William and Dr. Hooker, I have lately had the opportunity of examining a number of species of Marsilea in the Kew Herbarium, and I feel satisfied that the covering of the fruit cannot be trusted as distinctive of species. This series of specimens shows that *M. macropus*, Hook., varies considerably in size and in the covering of the sporocarps. I find amongst them a small plant in which parts of the same individual fruit are densely covered with hairs, and other parts are quite bald and minutely punctate; and although no sporocarp upon this specimen is so entirely bald as to accord with Dr. Hanstein's specific description, it is clear to my mind that the nature of the surface of the fruit depends upon its age and the friction to which it has been exposed, and that it is quite possible for sporocarps originally hairy to become absolutely naked. The Kew specimens have also cleared up some doubts which I had entertained, and which arose from the relative size of *M. macropus*, Hook., and the plants raised by Dr. Moore. In the 'Icones Plantarum' *M. macropus* is described as a span long, whereas the fronds of the plant raised by Dr. Moore are upwards of a foot in height. The difference in size would have led me to doubt the identity of the Nardoo with *M. macropus*; but this doubt was removed by finding in the collection at Kew a plant undoubtedly of the same species, with a frond at least fifteen inches long. The apex of the full-grown leaflets in Dr. Moore's plant certainly cannot be described as erose; they are almost entire, but sometimes very slightly crenate with the indentations far apart. This latter character however could not for a moment be relied upon as of specific value.

The result of what has been stated would seem to be that the plants raised by Dr. Moore are identical with *M. macropus*, Hook., although, until the former have fruited, which they have not yet done, the point cannot be considered settled. I am also inclined to believe that Dr. Hanstein's sporocarps were the produce of the same plant, and that his proposed new species cannot be retained.

Dr. Hanstein made some interesting remarks upon the germination of the fruits in question. These remarks, although not altogether new, are, I think, more complete and better illustrated than those of any previous writer upon the same subject, and occurring as they do in a

periodical but little devoted to natural history, and not easily accessible in this country, I have thought that this paper may be usefully concluded by a short summary of Dr. Hanstein's observations.

Fig. 2 represents two of the fruits received by Dr. Hanstein, drawn to their natural size.

One of these fruits was slightly shaved at the edge and boiled for a quarter of an hour, after which it emitted a long transparent flexible string of cellular tissue of great elasticity. After some hours, this string attained a length of 110–120 mm. and a thickness of 4 mm. It bore seventeen spore-tubes arranged almost in pairs as in fig. 3. The elongated tubes were narrowed in a stalk-like manner at the points of attachment to the string and approximated to one another on their inner side, and each of them on their outer side (*i. e.* the side originally next to the spore-case) exhibited (like the string itself) a firm ridge resembling a midrib and formed of narrow elongated cells. Upon this midrib are seated the sporangia, which also have short stalks. The indusium of the sorus consists of a single layer of large tabular thin-walled cells. The cells of the worm-like string are roundish-oval.

The sporangia (both those containing the large and those containing small spores) are sacs, formed of a simple very delicate cellular layer, which become rapidly disintegrated in water. After escaping from the sacs, the microsporangia appeared closely pressed around the larger macrosporangia and partly covering the latter (figs. 4 and 5). The yellow microspores, visible through the transparent membrane, give to the sacs an appearance like fish-roe. The macrosporangia appear white at first. In the closed dry sporocarps the sori are arranged transversely from back to front in two vertical layers alternately one above another.

Around the suture of the entire sporocarp and embedded in the seam there lies a cushion-like ring of cellular tissue, which when dry is of a horny consistency. This ring is more developed at the hinder part of the fruit than in front. The sporangial sacs are attached to this by both their ends, *i. e.* both by their stems and their apices. As soon as this ring comes in contact with water it absorbs it with avidity, enlarges visibly in every direction, and swells up into the gelatinous cellular string, which immediately frees itself all round from the coat of the sporocarp. When the experiment was repeated in lukewarm water with other sporocarps, this phenomenon occurred again in great perfection in the following manner :—

The fruit had lain in water for a week without change. It was then slightly scraped at the suture, like the former one. After a quarter of an hour the valves separated on this side, and the fore half of the gelatinous string emerged (fig. 6). The apices of the sori (which were attached to the string) immediately began to protrude themselves together with the latter and became more and more visible. After the fore half of the ring had entirely emerged, the water obtained easier access to the hinder part of the fruit, and the more robust half of the ring which is here embedded now began to break out with great rapidity on both sides (fig. 6). In the meantime, the sori were unable any longer to keep up with the expansion of the growing ring, and broke away one after another from the fore part of the ring, to which they are only slightly attached, but which retains traces of their places of attachment in the form of a corresponding number of small prominences (fig. 7 *r*). The sori were ruptured by being thus torn away. After about an hour, the receptacle had emerged entire in the form of a closed ring as it lies in the sporocarp, and had attained about the size and shape shown in figure 7, which represents a ring in a similar condition, produced by a third fruit. One of these rings remained three days in water without injury, and therefore the shape assumed must be considered to be the normal one. The ring is more frequently ruptured than entire, a fact which is explained by the easy separation of the parts at the points marked *r* in figure 7, and by the fact that this part, which is by far the weakest, is easily broken by the forcible opening of the valves at the fore margin. A portion of the ring might also be destroyed when the water by the decay of the valves first obtains access to the interior; whilst an artificial rupture of the sporocarp, resulting in an uninjured development of the ring, exhibits the phenomenon in the perfect condition above mentioned.

The hinder part of the ring is the most massive in the dry state, and expands more when moist than the fore part, as will be seen by fig. 7.

Dr. Hanstein considers that the volume of the moist and swollen receptacle is not less than two hundred times that of the same organ in the dry state, and he discusses the nature of the mechanism (viz. the effect of moisture upon the cells) by which this extraordinary increase of size is produced. To discuss the nature of this mechanism would occupy more space than I have at command; I must therefore refer those who wish for further details to Dr. Hanstein's paper.

In conclusion, I may add that although the macrospores of Dr. Hanstein's sporocarps grew into prothallia, he was not able to discover that the microspores yielded any spermatozoa. The prothallia all decayed without producing young plants, although in some of the archegonia the rudiments of an embryo were seen. Hofmeister (On the Higher Cryptogamia, Ray Society's Publications, 1862) is of opinion that the small spores lose their power of germination sooner than the larger spores. In his experiments on *Marsilea pubescens*, the macrospores which were 8½ years old produced prothallia, whilst the small spores exhibited no change.

Explanation of Plate VI.

Fig. 1. *Marsilea macropus*, drawn from a living specimen in my possession, slightly reduced, and raised from fruit brought to Melbourne by King. 2. Two sporocarps, natural size. 3. The contents of the sporocarp, protruded by boiling, natural size; *g*, *f*, skeleton of vascular bundles; *s*, sori. 4. A sorus, seen on the inner side. 5. A sorus, seen on the outer side. 6. An opening sporocarp, containing 20 sori. 7. A fully developed gelatinous ring, with 21 sori, natural size; *r*, the ventral portion of the ring. 8. A fruit-valve of the specimen shown in fig. 3, with a portion of the gelatinous string between the vascular network; figures 2–8 after Hanstein.

ON THE ARRANGEMENT OF THE BRITISH SALICES.

By Charles C. Babington, Esq., M.A., F.R.S.

The definition and classification of Willows has long been a disgrace to systematic botany. Is there any person in England who pretends that he can determine a *Salix* from the descriptions contained in any of our Floras, and are our Continental brethren in a much better condition? It is to be feared that an answer in the negative must be returned to each clause of this question. Every attempt, therefore, to facilitate the study of these plants, and to improve their classification, is well deserving of attention.

It appears that as long since as 1824 M. Dumortier published a new classification of Willows, in a Dutch journal, called 'Bijdragen tot de Natuurkundige Wetenschappen,' in which he established five subgenera of *Salix*:—

1. Amerina, the typical Willows; the *Fragiles*, *Albæ*, and *Triandræ*

of Borrer; the *Pedunculatæ laterales* of my 'Manual.' These possess two nectaries (as he calls the "glands" at the base of the germen and stamens of English authors), two or three free stamens, catkin-scales of uniform colour, and convolute vernation. These nectaries are blunt plates, one placed within the catkin-scale and next to it, the other on the opposite side of the germen or stamens. Dumortier then included in *Amerina* his present subgenus *Lycus*, the *Pentandræ* of Borrer, which has an urceolate nectary, much like the so-called "cup-shaped" perianth of *Populus*, from the middle of which the germen or stamens spring, 4–8 stamens, catkin-scales of uniform colour, and vernation convolute.

2. VETRIX, the *Repentes*, *Rosmarinifoliæ*, *Vacciniifoliæ*, *Cinereæ*, and *Nigricantes*, of Borrer's latest views. These have one simple cuneate nectary on the opposite side from the scale, two free stamens with fuscous-yellow spent anthers, catkin-scales discoloured at the end, and equitant vernation.

3. VIMEN, the Osiers; the *Viminales* of Borrer, with one simple nectary, two monadelphous stamens with yellow spent anthers, and revolute vernation.

4. HELICE (as he now calls it), the *Purpureæ* of Borrer, possessing a cuneate simple nectary, one stamen with a four-celled anther, or two monadelphous stamens with purple anthers becoming black when spent, and equitant vernation.

5. CHAMÆTIA, of which I have not seen his characters. It includes the "alpine Willows;" the *Myrsinites*, *Reticulatæ*, and *Herbaceæ* of Borrer; the *Pedunculatæ terminales* of my 'Manual.' Its characters appear to be, nectary of two opposite plates, (but Fries justly remarks "nectario in vivo ulterius probe observanda. Duo petit Dumortier,") two stamens, and inflorescence from the terminal or subterminal buds. We want much information in this group; the structure of the nectary is uncertain, the vernation is apparently unknown. But the subgenus is well marked by the position of the inflorescence upon *long leafy, persistent, terminal or subterminal shoots.* In all the rest of the genus the inflorescence is manifestly lateral. It is possible that Dumortier may have removed these difficulties in the Dutch 'Bijdragen' above quoted. Dumortier, in his very valuable paper entitled "Monographie des Saules de la Flore Belge," contained in the first volume of the 'Bulletins de la Société Royale de Botanique de Belgique,' recently issued

by that newly-established society, seems to suspect that Fries has not treated him quite fairly. He almost suggests that Fries derived his views from the above-mentioned Dutch paper. It is clear that Fries knew something about its contents, for he says ('Mantissa,' i. 37): "Duplicem [methodum], alteram e nectariis (quæ observandæ ipse jam ante finxeram), alteram e staminum numero, dedit Dumortier. Illa omni attentione digna." Fries certainly makes use of the nectary in his arrangement, and apparently did so at as early a date as Dumortier, for he quotes, in addition to the above remark in the 'Mantissa,' his own paper in the 'Physiographiska Sällskapets Årsberättelse' for 1824, as containing the greater part of the statements made in the 'Mantissa.' Not having been able to consult this Swedish journal, I cannot state what is really contained in it, but should certainly expect to find there a more or less full outline of the classification used in the 'Mantissa.' Otherwise, Fries did not publish his views concerning the value of the nectary before Dumortier had announced his ideas on the subject. It is my belief that their conclusions were arrived at contemporaneously and independently. Neither of those botanists is likely to have appropriated the labours of the other without acknowledgment. It is very unfortunate that each of them should have selected as his medium of publication a journal so little known out of its own neighbourhood, and written in a language so rarely understood.

I propose to append to these remarks an attempt to arrange our British species in accordance with Dumortier's recent classification, adding to his characters some points noticed in our books, and derived from the remarks of Borrer. It is highly satisfactory to find that very little alteration of the grouping proposed by that lamented botanist is requisite; and that, although he was not acquainted with the valuable characters pointed out by Dumortier, he formed a classification so nearly natural as that upon which the account of the Willows to be found in my 'Manual' is founded. We thus see what a very clear idea he had of the natural affinities of the species. As Dumortier takes no notice of the alpine species, they not belonging to the Belgian flora, I have had to add them as well as I can to the other groups. My object in now publishing this synopsis of the species is to endeavour to persuade other botanists to examine the plants and critically study the characters proposed in it.

BRITISH SALICES.

Section I. Vitisalix, *Dumort.*

Catkin and its leafy stalk deciduous together, lateral, appearing with the leaves. Scales uniform in colour. Nectary of 2 pieces, or urceolate; germen or stamens from the middle. Vernation convolute.

Subsection 1. Lycus, *Dumort.* Stamens 4–8. Nectary urceolate, undivided.—*Pentandræ*, Borr.—Leaves glossy, glabrous. Stipules soon falling.—Trees or large shrubs.

1. S. pentandra, *Linn.*

†2. S. cuspidata, *Schultz* (?).

Subsection 2. Amerina, *Dumort.* Stamens 2 or 3. Nectary of 2 pieces, one between the catkin-scale and germen, the other opposite to it.—Naturally trees.

i. *Diandræ.* Stamens 2. Catkin-scales soon falling.—*Fragiles* and *Albæ*, Borr.—Trees.

3. S. fragilis, *Linn.*

4. S. alba, *Linn.*

ii. *Triandræ.* Stamens 3. Catkin-scales persistent.—*Triandræ*, Borr.—Leaves lanceolate, approaching to ovate, glabrous. Catkins lax.—Osiers, naturally trees.

5. S. triandra, *Linn.*

*6. S. undulata, *Ehrh.*

Section II. Caprisalix, *Dumort.*

Catkins lateral, sessile, without leaves or with 2 or 3 small leaves or leaf-like bracts at the base; stalk sometimes lengthened with fruit, so as to resemble a leafy shoot, but deciduous with the catkin. Catkin-scales often discoloured at the end. Nectary simple (of 1 piece), on the opposite side of the stamens or germen from the catkin-scale.

Subsection 1. Helice, *Dumort.* Stamen 1, with a 4-celled anther; and 2 monadelphous, each 2-celled. Anthers purple, ultimately black. Nectary cuneate. Vernation equitant. Catkins bracteate at the base.—*Purpureæ*, Borr.

7. S. purpurea, *Linn.*

8. S. rubra, *Huds.*

Subsection 2. VIMEN, *Dumort.* Stamens 2, monadelphous. Anthers becoming yellow. Nectary linear. Vernation revolute. Catkin-scales discoloured at the end.—*Viminales,* Borr.—Catkins bracteate at the base. Stigmas not sessile. Pubescence of leaves silky.

* Stipules narrow.

9. S. viminalis, *Linn.*

** Stipules broad.

10. S. stipularis, *Sm.*
11. S. Smithiana, *Willd.*

Subsection 3. VETRIX, *Dumort.* Stamens 2, free. Anthers becoming fuscous-yellow. Nectary cuneate. Catkin-scales discoloured. Vernation equitant.

i. *Capreæ.* Style short. Stipules reniform, without basal glands. Leaves rugose, not turning black; pubescence crisped, not silky.—*Cinereæ,* Borr.

12. S. acuminata, *Sm.*
13. S. cinerea, *Linn.*
14. S. aurita, *Linn.*
15. S. caprea, *Linn.*

ii. *Phylicifoliæ.* Style long. Capsule stalked.

* *Nigricantes.* Leaves punctate beneath, turning black in drying. Stipules with basal glands.—*Nigricantes,* Borr.

16. S. nigricans, *Fries.*

** *Virentes.* Leaves smooth, scarcely any crisped pubescence beneath, not turning black.

17. S. laurina, *Sm.*
18. S. phylicifolia, *Linn.*

ii. *Incubaceæ.* Style short. Stipules linear.—*Fuseæ,* Bab. *Rosmarinifoliæ* and *Repentes,* Borr.

19. S. rosmarinifolia, *Linn.*
20. S. angustifolia, *Wulf* (?).
21. S. Doniana, *Sm.*
22. S. repens, *Linn.*
23. S. ambigua, *Ehrh.*

iii. *Daphnoideæ.* Style long. Stigma bifid. Capsule subsessile. —*Vacciniifoliæ*, Borr. *Arbusculæ*, Bab.—Catkins subsessile, bracteate at the base.

24. S. arbuscula, *Linn.*
25. S. Lapponum, *Linn.*

iv. *Chrysanthæ.* Style long. Stigma entire. Capsule sessile.—*Hastatæ*, Borr.—Anthers yellow, scarcely changing colour. Catkins appearing before the leaves, sessile, terminal and lateral, with very shaggy and silky scales. Leaves broad, roundish.

26. S. lanata, *Linn.*

[*S. hastata* of our books is now unknown. It probably belongs to this tribe.]

†27. S. acutifolia, *Willd.*

Section III. Chamelyx, *Fries.*

Catkins on long leafy persistent shoots from the terminal or subterminal buds. Stamens 2. Nectary "of 2 pieces, one between the catkin-scale and germen, the other opposite to it." Inflorescence from the terminal or subterminal buds.—*Chamætia*, Dumort.

i. *Myrsinites.* Catkins at the end of the terminal shoot, or of those from the last but one or two of the buds, but in such a manner as to seem a prolongation of the branch.

28. S. myrsinites, *Linn.*
29. S. procumbens, *Forbes.*

ii. *Reticulatæ.* Catkins opposite to the terminal leaves, with a bud between them.

30. S. reticulata, *Linn.*

iii. *Herbaceæ.* Catkins exactly terminal.

31. S. herbacea, *Linn.*

ON *QUERCUS FISSA*, *Champion*, IN REFERENCE TO THE DISTINCTIVE CHARACTERS OF QUERCUS AND CASTANEA; WITH REMARKS ON SOME OF THE GENERA OF CORYLACEÆ.

By H. F. Hance, Ph.D., etc.

With Annotations by M. Alphonse de Candolle.

[Knowing M. Alphonse de Candolle to be busily engaged in working up the *Cupuliferæ* for the 'Prodromus,' we submitted an abstract of Dr. Hance's paper to him, and were favoured with the appended annotations, which he authorizes us to publish in our Journal, and which will be appreciated as foreshadowing the arrangement to be adopted in the 'Prodromus.'—Ed.]

As far back as 1835, the late Professor Zuccarini, in a note on a remarkable Oak from Japan, *Quercus cuspidata*, Thunb., wrote these words :—" *Quercubus* cotyledones sunt carnosæ, planæ; *Fagis* et *Castaneis* irregulariter convoluto-plicatæ. Nullam aliam novimus notam qua affinia hæc genera stricte distinguantur" (Sieb. et Zucc. Flor. Jap. not. ad tab. 2). In 1850, the late Dr. Blume, describing a number of *Corylaceæ* from the Malayan Archipelago and Japan (Mus. Lugd.-Bat. nos. 18 and 19), arrived at substantially the same conclusions, so far as relates to *Quercus* and *Castanea*, his only really distinctive characters for the two genera being these :—

Castanea. Stamina 8–15. Involucrum fructûs coriaceum, echinatum. Cotyledones rugosæ.

Quercus. Stamina 5–10. Involucrum in cupulam lignescentem induratum, nuculam cingens v. involvens. Cotyledones plano-convexæ.

And he appended the following remark to his generic character of *Castanea* :—" Accuratos fines *Castaneam* inter et *Quercum* describere difficile, quum nonnullæ e *Quercubus* nostris Indicis et *Q. cuspidata*, Thunb., ex Japonia, conformatione involucrorum sive cupularum fructum includentium transitum manifestum exhibeant, quæ a *Castanea* non differre videantur. Sed in hac plures quam unum florem fovere solent, magisque inæquales et irregulariter tortuosæ sunt cotyledones quan in plerisque speciebus *Quercûs*, in quibus sunt plano-convexæ, quamquam et hac in re quædam ex Indicis nostris sunt excipiendæ."

On the differential marks assigned by this author, it will suffice to

remark that many true Oaks have more stamens than 10, though I cannot at this moment say whether they ever reach 15 (a point, indeed, of no consequence, since they are so variable in number in these and allied genera, *Fagus*, etc.); and that the texture and superficies of the fruit-involucre, irrespective of its slight value, is by no means constant or reliable; so that in fact the cotyledons alone remain available for their discrimination. He has not alluded to the dehiscence in his characters.

Quite recently (1861), Professor Miquel, after an examination of most of the *Corylaceæ* hitherto detected in Dutch India, makes the following observation on the very close affinity of *Quercus* and *Castanea*, and appends the subjoined clavis of these genera and their more immediate allies (Fl. Ind. Bat. Suppl. i. p. 353).

"*Quercûs*, *Castaneæ*, et *Callæocarpi* genera, solis floribus haud tuto discernenda, vix fructuum etiam fabrica diversa satis dignoscuntur. Cupula enim in quibusdam *Quercubus* Indicis totam glandem includens, transitum struit ad ipsas *Castaneas* et *Callæocarpi* genus. Profecto si florentia tantum specimina ad manus sunt, certum nullum exstare videtur trium generum discrimen, nam quod *Quercu* uni-, *Castaneæ* triflorum olim tribui solebat involucrum fœmineum, nihil valere illæ Indicæ *Castaneæ* probant, quæ in eadem spica utramque involucri speciem nobis exhibent. Attamen hæc genera haud omnino arbitraria conservanda, hisce præsertim characteribus discernuntur:

"Cotyledones plano-convexæ. Involucrum fœm. 1–3-florum. Cupula nunc in involucrum indehiscens aucta, 1-nucularis.

* Pericarpium coriaceum, læve: *Quercus*.

** Pericarpium lapideum, rugosum: *Lithocarpus*.

Cotyledones intus plicatæ, cohærentes, involucrum quadrivalve, nuculis triquetris 2–3: *Fagus*.

Cotyledones tortuosæ. Involucrum 3–1-florum.

† Fructûs involucrum coriaceum, spinis longis echinatum, 3–1-nuculare quadrivalve: *Castanea*.

†† Fructûs involucrum lignosum, crassum, processubus prismaticis undique extuberantibus, 3–1-nuculare, indehiscens, demum irregulariter ruptum: *Callæocarpus*."

From this it will be observed that the sole tangible difference between *Quercus* and *Castanea* lies in the structure of the cotyledons, and the subordinate mark of the echinate involucre of the latter. The state-

ment that the fruit-involucre of *Quercus* is indehiscent is invalidated by *Q. fagiformis*, *Q. cuspidata*, and other, or indeed probably all *Chlamydobalani*, in which it splits at maturity; and the pericarp, which is said to be always coriaceous, is lapideous or osseous in *Q. cornea* (the *Shi-li*, or "Stony Chestnut," of the Chinese) and other species.

Quercus fissa, the subject of the present note, is sufficiently abundant on the *skirts* of the Wongneichung* woods, as Champion accurately states; that is, it is only found at their upper limits. It is the finest of our Hongkong *Corylaceæ*, the largest leaves I have seen measuring 14 inches, and they are covered beneath, densely when young and more or less so at full maturity even, with what cannot be more accurately described than in the words used by Zuccarini, when writing of *Q. cuspidata*, as an "integumentum tenuissimum, ad lentem lepidoto-filamentosum," of an ochraceous or golden colour. Its fruit-branches are 3–6 inches in length, and the involucre has about 5 zones, with sinuated margins rising and falling in a very irregular manner, and with obsolete thickened teeth, so that they have as it were an eroded appearance. The same structure occurs less conspicuously in *Q. lancifolia*, Roxb., and is obviously a modification or extension of the annuli of the short-cupped *Cyclobalani* to the involucriform cupule. This involucre, which originally completely concealed the acorn, splits at maturity with tolerable regularity into 3–5 divisions, close to the base or point of attachment of the nut, and is densely covered internally with greyish silky tomentum. The fruit is ovoid, of a rich bright-brown outside, exactly like the horse-chestnut, and clothed with thick fulvous or ferruginous down inside, like our common chestnut. It has no stylar apiculus, and an oval, rugulose, pale, flat base (*hilum carpicum*). The cotyledons are most intricately plicated, and the testa, which is of a pale-fulvous hue and woolly, penetrates throughout all their convolutions, so that a transverse section of the seed exhibits one of the most striking examples of rumination known to me, being even more conspicuous than in the nutmeg.

The species was first characterized by the late Colonel (then Major) Champion, in 1854, in Hooker's 'Journal of Botany' (vol. vi. p. 114),

* The village of Wongneichung is at the head of the Happy Valley. The two names are used synonymously; but in the map accompanying Mr. Bentham's 'Flora Hongkongensis,' the former is erroneously transferred to a small place situated on the east side of Causeway Bay, the Chinese name of which I cannot at this moment ascertain.

the description being, from the statement at the head of the article, due to Mr. Bentham, and was referred to Blume's section *Castaneopsis.** The diagnosis is very accurate, but no notice is taken of the internal structure of the seed. It was next taken up in Dr. Seemann's 'Botany of the Voyage of H.M.S. Herald' (1857), Mr. Bentham's character being copied verbatim, and no observation being made on the seed; but an admirable representation of the plant was given by Mr. Fitch at pl. 92, with beautiful analyses from the pencil of Dr. Hooker, in which the convolution of the cotyledons is most faithfully represented. In the 'Flora Hongkongensis' of Mr. Bentham (1861), to the perhaps unparalleled accuracy and completeness of which as a descriptive work on the vegetation of so distant an island, I, as a tolerably close student for about eighteen years of the flora of southern China, may prefer a claim competently to bear grateful testimony, this species was also included, without any expression of doubt, in the genus *Quercus*, a fresh diagnosis being given, in which the cotyledons are noted as "intricately crumpled," and Seemann's plate being also referred to.

Thus much for the history of this interesting plant. We will now examine the question of its generic position. I have above referred to the opinions of some botanists, who have had good opportunities of investigating Asiatic *Cupuliferæ*, on the differential characters of *Quercus* and *Castanea*. A comparison of these with the descriptions given of many species, and the actual examination of a limited number, have satisfied me that these characters, so far as relates to species whose position is undoubted, and excluding for the present the plant under consideration, may be reduced to the following:—

Quercus. Fructûs involucrum nunc cupuliforme, nucem lævem basi tantum cingens, indehiscens; nunc capsuliforme, eam omnino vel fere obvolvens, maturitate irregulariter fissum; extus varie appendiculatum. Cotyledones facie planæ, extus convexæ, integræ vel plus minus sulcatæ seu lobulatæ.

Castanea. Fructûs involucrum capsuliforme, nucem omnino obvolvens, maturitate in valvas regulariter hiscens, extus echinatum. Cotyledones convoluto-plicatæ.

* This is the equivalent of Endlicher's *Chlamydobalanus*, a name prior by more than two years. It must be remarked, however, that probably from insufficient

These distinctive marks will, I believe, be found to include all species hitherto detected, with the exception of that under review, which differs from *Quercus* as thus defined by its convolute-plaited cotyledons, and from *Castanea* by the want of aculei to the involucre, and by its irregular dehiscence; and for the arrangement of which only three courses are open for adoption, which it will be worth while to examine.

1. *It may be included in Quercus*, as was done by its discoverer, and where it has been left undisturbed by those writers who have had occasion to treat of it. Mr. Bentham, for the purpose of retaining it there, has in the 'Flora Hongkongensis' distinguished *Castanea* from *Quercus* solely by the valved capsuliform echinate involucre, leaving the cotyledonous structure out of consideration. In this view I am unable to concur. To diversities in the appendages of the involucre it seems to me impossible to attach much weight, nor can I suppose Mr. Bentham himself does so, for it is difficult to imagine a stronger disclaimer of such a view than the following words, which I quote from his "Synopsis of the genus *Clitoria*" (Proc. Linn. Soc. ii. 35):—"The external forms acquired by fruits in their development from the ovary to maturity, and especially the foliaceous appendages they assume, are sometimes irrespective of their organic structure, and appear then of little more consequence than the foliaceous wings or appendages on the branches, inflorescences, or calyx-tubes. . . . Where the presence or absence of these appendages, or any peculiarity in their arrangement, appears to be consequent upon a general difference in the plan of the fruit or in the habit of the plant, or is accompanied by corresponding characters in other organs, it should be carefully attended to. But where one or more species of a natural genus differ from the rest by some such external peculiarity in the development of the fruit alone, it seems against all principles laid down for a natural method, to take that peculiarity as a generic character merely because it is a carpo-

materials, and because Wight's plate of *Q. lanceifolia* (Ic. Pl. Ind. Or. t. 212) quoted by him does not represent the cupula as fully enclosing the acorn, the Viennese professor restricted his section to *Q. cuspidata*, Thunb., excluding Roxburgh's plant and others which are certainly to be referred here. Endlicher's definition of *Chlamydobalanus* (Gen. Plant. Suppl. iv. part 2, p. 28, anno 1847!) is: "Cupula muricata, in urceolum clausum tandem irregulariter hiantem coalita." Blume's of *Castaneopsis* (Mus. Lugd.-Bat. n. 18, p. 288, Oct. 1850!): "Cupula nuculam omnino capsulæ instar obvolveus." Certainly the mention of the murication of the involucre of the only species decidedly known to Endlicher is no just ground for the rejection of his name. His character is otherwise unexceptionable.

logical one." It is incontestable that these remarks are as applicable to the appendages of a fruit-involucre as to those of a true pericarp, if not more so. Furthermore, we meet with the greatest diversity in this respect in species which every one unhesitatingly refers to *Quercus*. We find the capsuliform involucre smooth-zoned in *Q. lanceifolia*, Roxb., tuberculato-muriculate in *Q. cuspidata*, Thunb., distinctly echinate in *Q. fagiformis*, Jungh. There are the ringed cupules of *Q. annulata*, Sm., *Q. glauca*, Thunb., etc., and the ordinary squamate ones of the larger number of Oaks; the latter presenting considerable subordinate variations, both in form—from the flat disk-shaped cup of *Q. Skinneri*, Benth., merely supporting the acorn, to the hemispherical one of *Q. cornea*, Lour., which embraces all but its top—and also in clothing; from the appressed scales of the last-mentioned species to the dense, filiform, rigid, at length recurved ones of the curious Californian *Q. echinacea*, Torr., figured in the Pacific Railway Reports published by the United States Government (35th parallel, t. xiv.; Washington, 1857), where there is a mainfest approach to the Chestnuts. And I have in my possession a fine Japanese Oak, given me by Mr. J. G. Veitch, undescribed, I believe, when found by him, but probably since named by Dr. Lindley, with downy sinuate leaves like the *Robores*, the cup of which is covered with long, subulate, flat, scarioso-membranaceous scales. When such differences exist amongst the species of *Quercus*, we might, *à priori*, expect similar ones in the conterminous genus *Castanea*; and, although all the species hitherto referred there have echinate involucres, that is no reason why those yet to be discovered should; nor is it philosophical to exclude a species for failing in this character; for assuredly we are not justified in attaching a higher degree of importance to variations in the surface of a capsuliform involucre than that which is accorded to similar diversities in a cupular one. From the observation of Blume, above quoted, I think it likely, indeed, that on a general revision of the Order, some of the so-called Oaks will prove to be Chestnuts. In *Castanea vulgaris*, Lam., *C. concinna*, Champ., and most of the Indian species, the aculei, often branched, completely cover the involucre; but in *C. echidnocarpa*, Hook.f. and Thoms., which I assume to belong to the genus to which it is referred by its learned discoverers, for I have not been able to examine the seed myself, the involucre (which I should judge from my specimens to split irregularly) is distinctly zoned; the aculei, which do not occupy

the entire surface, being only the indurated teeth of the zones; and, were the obsolete ones of *Q. fissa* drawn out into spinous processes, there would be the most striking resemblance between the two fruits.

I admit that the regular dehiscence of *Castanea* is a point of some importance, but its morphological value is considerably diminished when it is borne in mind that in this case dehiscence is not the solution of a cohesion between single organs, for each valve is not a bracteal leaf, but a congeries of such organs; that in the cupped Oaks the small size of the involucre renders dehiscence unnecessary, and the cupulæ remain consequently at all ages entire; that in the *Chlamydobalani*, and also in *Q. fissa*, the involucre does split, irregularly it is true, being thus intermediate between the indehiscent *Quercus* and the valvular-splitting *Castaneæ*; whilst in *Q. fagiformis*, according to Miquel, it opens in three almost regular valves, approaching both in this respect and in the echination of its surface still closer to that genus.

But it is more particularly the cotyledonar structure which compels me to dissent from the location of the plant in question in the genus *Quercus*. The foregoing remarks will show the comparatively slender importance I attribute to the characters on which those who differ from me have chiefly relied. I am not aware, however, that any writer has hitherto expressly impugned the value of such a marked difference as that between flat and plaited cotyledons. The number of these organs furnishes primary characters for the classification of Phænogamous plants, and their structure, combined with other subordinate marks, is of sectional value in *Melastomaceæ*, *Combretaceæ*, and other families; and I cannot call to mind any other genus comprising plants differing as *Q. Robur* and *Q. fissa* do in this respect. I could easily understand the junction of *Castanea* and *Quercus* by one with such a decided leaning to synthesis as Mr. Bentham; but I confess myself unable to appreciate the grounds on which this distinguished botanist, whilst retaining both genera, has relied, as it appears to me, on quite subordinate marks for their separation, and passed over one of primary consequence.

2. *It may be separated as the type of a genus.*—I have stated above the particulars in which *Q. fissa* differs both from *Quercus* and *Castanea*, as at present generally understood. Though not myself disposed to go as far as Dr. Hooker and Mr. Bentham in the reduction of genera,—

for I believe synthesis as well as analysis may be carried to excess, and think the *via media* is also the *via tutissima*,—yet I am very far from considering these marks as sufficient to establish a title to generic rank, and particularly when the variety and gradations of structure in Oak involucres are borne in mind. This alternative, however, might be acceptable to those who, to use Mr. Bentham's words, hold the "principle that the lowest definable group above a species is a genus." But in this case it would be scarcely consistent to leave *Quercus* as it stands; for other species have as much, or rather as little, claim to such a distinction.

3. *It may be referred to Castanea.*—From the preceding discussion it will be apparent that this is the view held by myself, so much does the cotyledonar structure outweigh in my judgment the points of agreement between Champion's plant and certain Oaks. Other plans for the delimitation of the two genera might, of course, be adopted; for instance, all the capsuliform species might be placed in *Castanea*, irrespective of other characters, or it might be restricted to those with regular valvular dehiscence; but these arrangements would be open to the same objections as those adopted by Mr. Bentham. Indeed, if we are to consult nature, I see no alternative between the reception of the view I am advocating and the combination of the two genera, which seem to me more correctly kept apart.*

While I am writing on a Hongkong Cupulifer, I may take the opportunity of stating that *Q. Hancei*, Benth., of which I discovered the fruit at the close of last summer, belongs to the *Cyclobalani*, not to the *Lepidobalani*, where it is referred in the 'Flora Hongkongensis;' and I would also note that the tomentum with which the under surface of the leaves of *Q. Championi*, Benth., is so densely clothed, is formed of curious pale straw-coloured stellate hairs, with the centre where the rays converge of a deep yellow, and *glandular*.

I append a few brief observations on some Corylaceous genera, in the delimitation and admission or rejection of which Mr. Bentham's admirable remarks on carpological differences, above quoted, should be steadily kept in view.

* "Le *Quercus fissa*, Bot. Herald, tab. 92, rentre dans les *Quercus*, en admettant ma division. Certainement il n'a ni le fruit échiné, ni les styles nombreux des *Castanea*."—*Alphonse de Candolle.*

Distegocarpus, Sieb. et Zucc., has been shown by Blume to differ in no respect from *Carpinus*.

Fagus, which Zuccarini, to judge from his note above quoted, would appear to have thought not distinct from *Castanea*, is, as it were, intermediate between that genus and *Quercus* in the structure of the cotyledons, which are plaited only on their faces. It is further well distinguished from both these genera by the male flowers having a gamophyllous campanulate perianth, and also by its inflorescence. MM. Hombron and Jacquinot have separated the Antarctic Beeches from their northern congeners, and formed from them two genera, *Calusparussus* and *Calucechinus*, on what grounds I do not know. Blume has also since proposed to distinguish some of these under the name of *Nothofagus*, but there is assuredly nothing in his character (Mus. Lugd.-Bat. n. 20, p. 307) to justify such a proceeding. Indeed, the chief distinction between the species of the northern and southern hemispheres appears to be that the latter have the male flowers either single or at most ternate, and arranged on very short axillary stalks; whilst in the former they are disposed in capitula (usually called *catkins* by authors, but which a comparison between the two series seems to render an improper term in this case) of twelve or thereabouts, supported on an extremely long common peduncle.

Synædrys, founded by Lindley on Loureiro's *Quercus cornea*, and which Endlicher, without knowing the type, was inclined to refer to *Lithocarpus*, differs in no respect from *Quercus*. It is true that imperfect septa, formed by laminæ of the hard bony pericarp, often but not invariably project from its inner surface, which is always irregular in contour, and thus cause the seed to be more or less sulcate, but it is impossible to lay any stress on this peculiarity, shared in a still higher degree by *Q. Skinneri*, Benth., evidently a near ally, as its bony fruit proves, but which is notwithstanding retained by Dr. Lindley himself among the Oaks. Nor can greater importance be attached to the trivial character of the flattened or depressed top of the fruit, projecting beyond the sides.

Lithocarpus has no better claims to separation, being merely kept apart on account of its rugose and stony acorn, the latter peculiarity being, as just observed, common to other Oaks, whilst the sculpturing of its surface is of no value at all. I may add, that the included portion of the acorn of *Q. cornea* is evidently though superficially rugulose.

Callæocarpus, recently established, must, there can be little doubt, be reduced to *Castanea*, from which, as defined by Miquel, it is, as far I can judge from his character, only to be distinguished by the irregular dehiscence of the involucre, and by certain differences in the female perianth, which I suspect will on careful examination prove to be of little moment.

If these reductions are made, the absolute characters of *Quercus* and *Castanea* may be thus formulated :—

Quercus. Fructûs involucrum nunc cupuliforme, indehiscens, nunc capsuliforme, maturitate irregulariter v. subregulariter fissum. Cotyledonum facies planæ.

Castanea. Fructûs involucrum capsuliforme, maturitate regulariter v. irregulariter fissum. Cotyledones convoluto-plicatæ.*

* QUERCUS, Linn. et auct.—Quercus *et* Synædrys, *Lindl.*—*Flores masc.* in amento solitarii, rarius ternati. *Flores fœminei* in cupulâ (involucro) solitarii, cupulis proximis interdum connexis. *Ovarium* imperfecte 3-loculare. *Styli* 3 (raro 3–4). *Ovula* in singulo loculo 2, angulo interiori nunc basi nunc prope apicem loculi appensa. *Fructus* e cupulâ mutatâ, squamosâ vel zonatâ, nunquam aculeis onustâ, et glande liberâ, exsertâ, vel inclusâ constans. *Semen* abortu unicum, ovulis abortivis nunc circa ejus basin nunc circa apicem inter vestigia parietum persistentibus. *Cotyledones* crassæ, sæpius plano-convexæ et integræ, dorso frequenter undulatæ, rarius sinuato-lobatæ.—Spicæ *plerumque unisexuales.*—De subdiv. confer ad Alph. DC. Note Nouv. Caract. Fruit Chênes (in Bibl. Univ. Oct. 1862, et Ann. Sc. Nat. ser. 4, v. 18 ; Seemann's Journ. of Botany, vol. i. p. 139).

CASTANOPSIS, Spach, Hist. Veg. Phæn. xi. p. 185.—Quercus, *subdiv.* Castanopsis, *Don, Prod. Fl. Nep.* (*non sectio* Castanopsis, *Bl.*) ; Castaneæ sp., *Roxb.*, *Lindl.*, *Blume, etc.*—*Flores masc.* in amento glomerati. *Flores fœminei* inter involucrum squamosum 3–1. *Ovarium* 3-loculare. *Styli* 3 (raro 3–5). *Ovula* in singulo loculo 2, angulo inferiori (an semper ?) inserta. *Fructus* ex involucro mutato, echinato, sæpe dehiscente, et nuculis 3–1, inclusis, constans ; aculeis sæpius ramosis, nunc simplicibus conicis, extra squamas tarde evolutis. Nuculæ cartilagineæ, liberæ. *Semen* cujusve nuculæ abortu unicum. *Cotyledones* crassæ, plano-convexæ, farinosæ.—Spicæ *bisexuales.*—Arbores Asiaticæ et Californicæ, infloresc. *Quercuum*, sectionis *Pasaniæ*, etc.

Sectio 1. EUCASTANOPSIS.—*Involucrum dense aculeis echinatum.*

C. Indica (Castanea Indica, *Roxb.*). *C. chrysophylla* (Castanea, *Hook.*). *C. concinna* (Castanea, *Champ. et Benth.*). *C. spectabilis* (Castanea, *Miq.*). *C. brevicuspis* (Castanea, *Miq.*). *C. costata* (Castanea costata, *Bl.*). *C. Tungurrut* (Castanea, *Bl.*). *C. Javanica* (Castanea Javanica, *Bl.*). *C. castanicarpa*, Spach (Castanea Roxburghii, *Lindl.*). *C. sessilifolia* (Castanea, *Bl.*). *C. hystrix* (Castanea, *Hook.*). *C. acuminatissima* (Castanea, *Bl.*) *C. tribuloides* (Quercus tribuloides, *Sm.* *C. argentea* (Castanea, *Bl.*). *C. echidnocarpa* (Castanea, *Hook. f.*).

Sectio 2. CALLÆOCARPUS.—Genus *Callæocarpus*, Miq.—*Involucrum tuberculis ovali-conicis, secus facies 3 instructum.*

C. Sumatrana (Callæocarpus Sumatrana, *Miq.*).

CASTANEA, Tourn.—Fagi sp., *Linn.*—*Flores masc.* in amentis fasciculati. *Flores fœminei* intra involucrum plures, sæpius 3, nunc 1. *Ovarium* pluri-

In conclusion, I may say that I entirely concur with Dr. Lindley in regarding *Juglandaceæ* as the nearest direct allies of *Corylaceæ*. That eminent botanist adduces the lobed and wrinkled cotyledons of certain Oaks in proof of this affinity; and I may add that were the sinuosities of the seed of the common Walnut closed,—in other words, were their sides pressed together,—it would exhibit some analogy with that of *Fagus*, the plication being dorsal, however, instead of facial. A direct proof of this relationship is furnished by a fine new Oak detected by me last summer in the Hongkong woods (*Q. Irwinii*, mihi), the branchlets and leaves of which abound in a pleasant, fragrant, resinous juice, so that the latter, which are naturally opaque, appear as if varnished when prepared for the herbarium by washing over with a spirituous solution of bichloride of mercury. And a comparison of the three-lobed bracts subtending the female flowers of *Enghelardtia* with the same organs in *Carpinus*, will, I think, place this affinity in a still clearer light. Had Pœppig's *Fagus glutinosa* belonged to the genus to which that traveller referred it, it would by its pinnate leaves have furnished an additional link of connection; but his plant was long ago ascertained by Mr. Miers to be a species of *Eucryphia*, since published by M. Claude Gay under the name of *E. pinnatifolia*.

Were I more favourably located, with access to extensive herbaria and libraries, I have no doubt that I might have illustrated and enforced the arguments adduced above by examples both more numerous and more striking; but I trust I may plead my habitat, "in ultimo fere orbis angulo," to use the words of Thunberg, and with nothing but my own library and herbarium to fall back on, as some excuse for whatever defects or oversights may be observed in this paper.

British Vice-Consulate, Whampoa, Feb. 8, 1863.

(sæpius 6-) loculare. *Styli* tot quot loculi, lineares, acuminati, rigidi. *Ovula* in singulo loculo 2, ab angulo superiore pendentia. *Fructus* ex involucro accreto, mutato, aculeis ramosis præter squamas donato, demum 2-4-partito, et nuculis vel abortu nuculâ constans. *Nuculæ* cartilagineæ, liberæ, inclusæ. *Semen* cujusve nuculæ abortu unicum, ovula abortiva prope verticem gerens, vel rarius semina 2-3, parietibus membranaceis tunc segregata. *Cotyledones* crassæ, farinosæ, extus undulato-ruminatæ, intus undulatæ adpressæ.—Arbores, *in hemisphærio boreali crescentes*. Spicæ *uni- et bisexuales*.—Involucri aculei tarde evoluti, nec squamæ in aculeos mutatæ ut auctores dixerunt.

C. vulgaris, Lam. *C. pumila*, Mill.

Alphonse de Candolle.

ASPLENIUM SERPENTINI, *Tausch*, A RECENT ADDITION TO THE BRITISH FERNS.

It may be interesting to the readers of the 'Journal of Botany' to learn that the true *Asplenium Adiantum-nigrum*, var. *obtusum*, has been found in Great Britain. By the true *obtusum* is meant the *Asplenium obtusum* of Willdenow, and the *Asplenium Serpentini* of Tausch, which are synonymous, included by Heufler under the name of *A. Adiantum-nigrum Serpentini*. This Fern, not hitherto recorded as British, was sent to me last autumn, by Mr. A. Christie, from the serpentine rocks in the Banffshire and Aberdeenshire divisions of the parish of Cabrach. I hope to be able to give in this Journal a more complete notice of this interesting plant at some future time, and in the meanwhile send this brief record of the fact of its discovery.—THOMAS MOORE.

Chelsea, May 16th, 1863.

CARPOMITRA CABRERÆ ON THE JERSEY COAST.

One of our rarer seaweeds, *Carpomitra Cabreræ*, was found on the 1st of April, 1863, at low-water mark, floating in a rock-pool near Elizabeth Castle, St. Aubin's Bay, Jersey, apparently washed in from the south-west.—E. J. DYKE-POORE.

VIVIPAROUS REPRODUCTION OF *SAGINA NODOSA*.

In the 'Bulletins de la Société Royale de Botanique de Belgique,' i. 160, M. J. A. Henrotay gives an interesting account of his having discovered that the fascicles of leaves found upon *Sagina nodosa* do not decay at the same time as the stems upon which they grow, and the larger leaves in the axils of which they are produced, but live through the winter, root, and produce the rosettes or "primary stems" of independent plants in the succeeding spring. He noticed that the plant rarely ripens any seed, and that the species is therefore chiefly repro-

duced by means of these fascicles of rather fleshy leaves. The young roots and first new leaves appear to be nourished at the expense of the materials laid up in them, as they gradually shrink as those organs are developed, and by the time that they are exhausted the roots are able to derive the requisite nourishment from the soil; in fact, they act just as bulbs and oviparous buds do in other plants which increase in that way. M. Henrotay was very careful in his observations, and made several experiments for the purpose of becoming quite sure of the facts, before venturing upon their publication. They are most creditable to his care and judgment, and a valuable addition to our botanical knowledge.—C. C. Babington.

FECUNDATION OF *GLOXINIA ERECTA*.

In the Bulletin de la Soc. Botan. de France, vol. vii. p. 772 (published in April, 1863), there is a note by M. Ern. Faivre upon the fecundation of *Gloxinia erecta*, well deserving of attention. Amongst other interesting remarks, he states as follows:—On June 26th, four flowers opened at 4 P.M.; June 27th, at 7 A.M., the style was 10 millimetres in length; at 7 P.M. of that day, it had attained a length of 16 millim.; on the 28th, at 7 A.M., it measured 22 millim.; at 3 P.M. it had lengthened sufficiently to come into contact with the coherent anthers, and, being arrested in its ascent by them, was much curved. This contact lasted for about four days. On July 2nd, it released itself from the anthers, was straightened, and continued to lengthen for twenty-four hours, when it had attained its full length of 33 millimetres. The flower did not fall until July 7th. The filaments of the stamens also slightly lengthen, but more slowly than the style, and are recurved after fertilization has taken place. Thus in seven days the style grows from a length of 10 millimetres to one of 33; after the expansion of the flower, it takes about 32 hours for the stigma to reach the stamens, and is lengthened 12 millimetres in that time. Only two of the four flowers observed were fertilized and produced seeds. M. Faivre has observed the same thing in *Agave densiflora* and *Bonapartea juncea*.—C. C. Babington.

MEMORANDUM.

Edible Plants of Port Lincoln, Australia.—The natives divide all their articles of food into two classes—the "paru" and "mai,"—the former including all animal, and the latter all vegetable articles of food; of these are the various descriptions of roots, such as the ngamba, ngarruru, and others, all of about the size of a small carrot, and of its shape, of a more or less acrid taste, and which are first roasted in hot ashes, and then peeled for eating. Of the grass-tree, *Xanthorrhœa*, they eat the lower part of the stem not yet grown above the surface of the ground; it is by no means tasteless, but certainly cannot contain much nourishment; besides these, they also eat various kinds of fungi. Although to Europeans the country offers scarcely any kind of eatable fruit, it yields a pretty good variety of such as affords valuable food to the blacks. The most important and abundant fruit is that of a *Mesembryanthemum*, to which the Europeans have given the somewhat vulgar name of pigfaces, but the natives the more euphonical one of karkalla. Pressing the fruit between their fingers, they drop the luscious juice into the mouth. During the karkalla season, which lasts from January till the end of the summer, the natives lead a comparatively easy life; they are free from any anxiety of hunger, as the plant grows in all parts of the country, and most abundantly on the sandy hills near the sea. The men generally gather only as much as they want for the moment, but the women collect large quantities for eating after supper. The Port Lincoln blacks eat only the fruit of this plant, but those living between the Grampians and the Victoria Ranges, as a substitute for salt with their meat, eat also the leaves of this saline plant. All other edible fruits grow in pods, or in the shape of berries on small bushes. Some of these they allow to ripen, as, for instance, the fruit of the *Santalum* and that of a species of *Epacris*, which, growing on the sea-shore, bears small red sweet berries called "wadnirri." Another plant, "karambi," also growing on the sea-shore, is the *Nitraria Billardierii.* The *Nitraria Billardierii* belongs to the Order of *Malpighiaceæ*, grows in large quantities on high sandhills along the western sea-coast of Port Lincoln, has a fruit in form and size resembling an olive, is of a dark red colour, has a very pleasant taste, and is exceedingly cooling. In December and January the bushes are so full of fruit, that the natives lie down on their backs under them, strip off the fruit with both hands, and do not rise until the whole bush has been cleared of its load. At the time above-mentioned, I travelled with five natives, who carried my collection of plants and blankets on a very hot day through this arid country; all at once they threw off their loads, ran as quickly as they were able to one of the high sandhills, and disappeared amongst the bushes. Not knowing the meaning of all this, I followed them, and found the whole five, as above described, lying on their backs under the bushes. I could not do better than do so likewise, and when we had refreshed ourselves we continued our journey. Other fruits they collect before they are ripe, and roast them in hot ashes, such as the berries of the pulbullu, and the pods of the

menka, and the nundo. The last-mentioned fruits, highly valued by the natives, are of the *Acacias*, growing abundantly on the sandy downs of Sheaford and Coffin's Bay, and by attracting thither a numerous company of blacks, they frequently give occasion for disssension and quarrels. As a proof of the value or consideration attached to this fruit, it may be mentioned that, in order to annoy their adversaries, the Kukata tribe of the north-west, famous for their atrocity and witchcraft, often threaten to burn or otherwise destroy the nundo bushes. As only few gum-trees grow in Port Lincoln, they have but little of the edible gums upon which the Adelaide tribes live almost exclusively during the summer months; what they get they collect from the acacia-trees, which however grow but sparingly, yielding very little gum.—*Wilhelmi, in Transactions of the Royal Society of Melbourne.*

NEW PUBLICATIONS.

Flora of Edinburgh; being a List of Plants found in the vicinity of Edinburgh. By J. H. Balfour, Professor of Botany; assisted by J. Sadler, Vice-Secretary of the Botanical Society. 174 pp. 12mo. Edinburgh: Black. 1863.

This 'Flora' contains a list of species inhabiting a circle having a radius of about twenty-five miles from Edinburgh as a centre, and furnishes a very full statement of the places where they may be found. It does not enter upon critical questions relative to the characters of the species, nor their distinctness; neither does it point out with very great exactness (except as far as giving the names of localities) the relative frequency of the species; nor do we easily learn from it in how far the more common kinds extend throughout the country or are absent from certain parts of it. The country is not divided into districts, as is now usual in local Floras, nor are even the names of the counties appended to those of the places mentioned. In general there is no account of the character of the soil, if porous or retentive. In short, the book is intended solely as a guide to the collecting student of Edinburgh, and as such it will doubtless be found very useful. That being its object, the author is probably wise in not extending its bulk and price by the addition of the information which we have intimated as absent. Nevertheless this absence causes it to take rank, not with the modern local Floras, but with the older works of like intent with itself. We must express our hope that it is to be regarded as the fore-

runner of a more elaborate work, which will convey information to the botanical geographer, as well as to the collector. From Dr. Balfour's great knowledge, and his very extended opportunities, we may reasonably look for such an extended work from his pen. We hope that the time is not distant when we may receive it.

Flora von Hannover. Ein Taschenbuch zum Bestimmen der um Hannover wildwachsenden und allgemeiner cultivirten Gefässpflanzen. Von G. von Holle, Ph.D. Demy 8vo. Heft I. Hanover: Rümpler. 1862.

Farnflora der Gegend von Hannover. Von G. von Holle, Ph.D. Demy 8vo, 31 pp. Hanover: Rümpler. 1862.

We have here the first instalment of a Manual Flora of the environs of the town of Hanover, conscientiously executed, and intended for the use of beginners, amateurs, and schools. When completed, we may return to the work, and will merely remark that the present number comprises the Ferns, Monocotyledons, Gymnosperms, *Amentaceæ*, and *Juglandaceæ*. Since Ehrhart, a pupil of Linnæus, took up his abode at Herrenhausen, and published his 'Beiträge,' there has not been a local botanist of eminence at Hanover; and since that time science had made such rapid strides, that much remains to be done before the botany of this particular locality is brought up to our present state of knowledge.

Dr. von Holle divides and arranges the Phanerogamic plants in a manner slightly differing from that adopted by Lange and Willkomm. His primary divisions are Gymnosperms and Angiosperms, the latter including, not only all Exogens (with the exception of *Coniferæ*), but also the Endogens. By this arrangement, the Gymnosperms are placed between the higher Cryptogams and the Endogens. Endlicher ('Genera Plantarum') could not make up his mind to remove the Cycads from the neighbourhood of the Ferns; and by adopting Dr. von Holle's arrangement they would be retained in that place, associated with the true Conifers. We do not wish to argue in favour of this view, but may remark that *Welwitschia* might be regarded as much a transition from Gymnosperms to Endogens, than the Cycads from Gymnosperms to Cryptogams.

The little pamphlet, entitled 'Farnflora der Gegend von Hannover,' is merely a reprint of the first thirty-one pages of this Manual, and enu-

merates the following Ferns and their allies for the convenience of those specially interested in them:—*Polypodium vulgare*, L., *P. Phegopteris*, L., *P. Dryopteris*, L., *P. Robertianum*, Hoffm., *Cystopteris fragilis*, Bernh., *Aspidium Filix-mas*, Sw., *A. cristatum*, Sw., *A. spinulosum*, Döll. (including *elevatum*, A. Braun, = *A. spinulosum*, Sm., and *dilatum*, Döll., as varieties), *A. Oreopteris*, Sw., *A. Thelypteris*, Sw., *A. aculeatum* var. *vulgare*, Döll. (*A. lobatum*, Sw.), *Asplenium Filix-fœmina*, Bernh., *A. trichomanes*, L., *A. Ruta-muraria*, L., *A. septentrionale*, Sw., *Scolopendrium officinale*, Sw., *Blechnum Spicant*, Roth, *Pteris aquilina*, L., *Osmunda regalis*, L., *Ophioglossum vulgatum*, L., *Botrychium Lunaria*, Kaulf., *Equisetum arvense*, L., *E. Telmateja*, Ehr., *E. sylvaticum*, L., *E. pratense*, Ehr., *E. palustre*, L., *E. limosum*, L., *E. hiemale*, L., *Lycopodium Selago*, L., *L. annotinum*, L., *L. clavatum*, L., *L. inundatum*, L., *L. complanatum*, L., and *Pilularia globulifera*, L.

Tropical Fibres; their Production and Economic Extraction. By E. G. Squier. London: Madden. New York: Scribner and Co.

Whatever success Mr. Squier may have achieved in the field of ethnology, he has made a serious mistake in trying his hands at the subject of tropical fibres. To a botanist it is quite heartrending to see the series of blunders he commits from the opening to the closing paragraph. Out of every ten names five are sure to be misspelt; and genuine information (culled from whatever limited sources were at hand) is so hopelessly intermingled with error, and so frequently applied to the wrong species of plant, that the book must be pronounced a worthless compilation, illustrated by sixteen badly-executed plates, two of which have been copied from the 'Popular History of the Palms.' The arrangement of the book is as illogical as its contents are untrustworthy. The first chapter professes to give an account of the "Extent of Consumption and Modes of Extraction" of fibres, the second deals with "Fibrous Plants of America and the East Indies," the third with "Fibre-producing Plants," the fourth with "Endogenous Plants," and the fifth with "Exogenous Plants"—amongst the latter are included the "*Yucca*, *Liliacea*, or Lily family." Commercial men, for whose benefit this book is chiefly intended, will smile when comparing Mr. Squier's quotations with those of the circulars issued by our great London firms.

BOTANICAL NEWS.

A circular has been issued, calling attention to a vote of thanks given to Dr. Lindley, on his retiring, after forty years' service, from the secretarial duties of the Royal Horticultural Society, and also inviting subscriptions, limited to one guinea, for a Lindley Testimonial.

Mr. Gustav Mann, the botanical collector for Kew Gardens on the west coast of Africa, is now making for England, and will visit on his way Teneriffe and Spain.

M. Pablo Fest, at present residing at Cuyaba, in the Brazilian province of Matto Grosso, and collecting living plants, seeds, and specimens for the herbarium and museum, would be able to execute any orders he may receive. Letters should be addressed to the care of M. von Gülich, Prussian Legation, Montevideo, who has kindly consented to forward them.

Mr. Jacob Storck, on sending a second collection of dried plants, says in a letter to us that he has made an excursion to the interior of Viti Levu and actually seen the inland lake, of the existence of which the Government mission to Fiji could only report on hearsay. He speaks of an edible *Cupulifera*, and the discovery of a new pinnated Palm, resembling *Kentia ? exorrhiza*, and attaining 40 feet in height. His cotton plantation had fully answered his expectation. "I have only three labourers," he writes, "and this year (1862) I have sold 50 cwt. of cotton; next year I calculate upon 500 cwt."

The Austrian Government, we learn from Vienna, has granted 80,000 florins towards defraying part of the expenses of publishing the natural history collections formed during the voyage of the 'Novara.' Dr. Kotschy and Professor Unger are now engaged in bringing out the narrative of their trip to Cyprus, which has been productive of a rich collection of plants, twelve hundred species having been gathered in that island in less than four months.

Professor Asa Gray, in a recent issue of the Proceedings of the American Academy, gives obituaries of four botanists of the United States, who died in 1862, viz. Benjamin D. Greene, Esq., of Boston, on the 14th of October, at the age of 69 years; Dr. Asahel Clapp, of New Albany, Indiana, on the 17th of December; Dr. Melines C. Leavenworth, in the vicinity of New Orleans, in December; and Dr. Charles Wilkins Short, at Louisville, Kentucky, on the 7th of March, in his 69th year.

Died, on the 19th of April last, at Mutzig, aged 67 years, M. Paul Constant Billot, Professor of Natural History, well known by his carefully and critically named plants of central Europe, and the valuable annotations accompanying them.

Botanical Society of Edinburgh.—*March 12th.*—Professor Balfour gave a description of the *Pandanus odoratissimus*, which has recently produced pistilliferous flowers in the Palm-house at the Royal Botanic Garden. The plant is about 50 years old, and 40 feet in height, with a stem about 2 feet in circumference. It has 16 large alternate branches, and is provided with 60 aerial roots, some of them 5 feet long. The leaves vary in length from 3½ to 5 feet.

The plant has produced two globular spadices of pistillate flowers. As no staminate flowers have appeared on any of the plants in the Palm-house, the fruit will not be perfected. The fragrance is chiefly confined to the staminate flowers. A specimen of the pistilliferous spadix was exhibited. The species, so far as known, has not previously produced flowers in this country.

Mr. Elliott explained to the meeting his process of taking impressions of fresh plants by means of a press and printers' ink. The specimens are covered equally on both sides with the ink by means of a roller, and then placed in the press between sheets of paper, and pressure applied. The whole process is exceedingly simple, and may prove useful to travellers.

Professor Archer referred to the various economical uses to which the Carnaüba Palm (*Copernicia cerifera*) is applied, and exhibited a series of specimens illustrating the different products obtained from the tree.

Mr. Sadler noticed the occurrence of various rare species of Mosses in Britain, and read extracts from letters received from Miss M'Inroy, of Lude, Mr. M'Kinlay, of Glasgow, and Mr. Wilson, of Warrington, regarding the Mosses of Blair-Athole, Ben-Nevis, and elsewhere.

Mr. M'Nab read a register of the flowering of spring plants in the open air at the Royal Botanic Garden. (Second list.)

A letter was read from Professor Martius, of Erlangen, to Professor Balfour, in which he says: "I wish to call your attention to the fact that the seeds of *Abrus precatorius* contain an alkaloidal poisonous matter. It is easily obtained by boiling the crushed seeds several times with alcohol of 0·830 to 0·812, filtering, and then distilling the alcohol until two ounces remain per pound of seeds. If it stands a long time, the poisonous matter crystallizes out. Weak alcohol exhausts the colouring matter."

A note was read from Captain Thomas, R.N., intimating that he had discovered *Botrychium Lunaria* and *Ophioglossum vulgatum* in Benbecula, one of the islands of the outer Hebrides.

Walter Elliott, Esq., exhibited a volume of drawings executed by Mungo Park, the property of Thomas Brown, Esq., of Lanfine.

Botanical Society of Edinburgh.—*April 9th.*—Professor Maclagan, President, in the chair. 1. Note on *Lemania variegata* of Agardh. By George Lawson, LL.D. 2. Some account of *Paullinia sorbilis* and its products. By T. C. Archer, Esq. There is no more remarkable plant in the Natural Order *Sapindaceæ*, if regarded from an economic point of view, than *Paullinia sorbilis*, but it is so little known that I cannot trace its history in any book on Brazil, although I have consulted Spix and Martius, Humboldt and Bonpland, Gardner and Spruce's letters, and others. From the large seeds of this plant is manufactured the interesting material called "Guarana," extensively used in Brazil and other parts of South America, as a nervous stimulant and restorative. The seeds are deprived of their coverings and then pounded into a paste, which, hardened in the sun, constitutes the substance known as Guarana, of which specimens are on the table. It is used both as a remedy for various diseases, and also as a material for making a most refreshing beverage, and it adds another of those incidents so puzzling in human history of the discovery of

such qualities in plants least likely to be suspected; such, for instance, as that the leaves of tea, the seeds of coffee and cacao, the leaves and twigs of the various American Ilexes, and other plants, should have this wonderful restorative effect on the nervous system, and that this should not be a mere vague notion such as attaches to thousands of other plants, but that it really depends upon the presence of a chemical principle, the same in all, and the operation of which can be satisfactorily explained. The presence of an alkaloid was discovered some years ago in Guarana by Dr. Theodore von Martius, of Erlangen, which he called Guaranine, but its identity with theine was soon established, and subsequent analyses, especially one by Dr. Stenhouse in 1856, proved that not only was the active principle of Guarana identical with theine, but that, as far as is known, no other substance yields it so abundantly. He thus compares it with the other sources of theine:—Guarana, 5·07 per cent.; good black tea, 2·13; Kemaon black tea, 1·97; various samples of coffee, 0·8 to 1·00; dried coffee-leaves, 1·26; maté, or Paraguay tea, 1·2. The mode of using the Guarana is curious and interesting. It is carried in the pocket of almost every traveller, and with it the palate bone or a scale of the large fish (*Sudis gigas*) locally called "Pirarucu," the rough surfaces of which form a rasp upon which the Guarana is grated; and a few grains of the powder so formed are added to water and drunk as a substitute for tea. The effect is very agreeable, but as there is a large portion of tannic acid also present it is not a good thing for weak digestions. But its remarkable restorative power has also given it a great reputation as an aphrodisiac, and Martius not only speaks of it as a "*nobile remedium*" of great value in various disorders, but he also writes, "*Appetitum venereum movet, spermatis vero fœcunditatem diminuere dicitur.*" Another species of this genus, *Paullinia Cupana*, also enters into the composition of a favourite national diet-drink. Its seeds are mingled with cassava and water, and allowed to pass into a state of fermentation, bordering on the putrefactive, in which state it is the favourite drink of the Orinoco Indians. It would be interesting to know if this preparation also contains theine. Both the Australian and French physicians have introduced Guarana into medical practice, though with what effect I am unable to state. 3. Notice of Observations, by F. Cohn, on the *Contractile* Filaments of the Stamens of Thistles. 4. On an easy and effective style of Nature Printing. By Mrs. Stirling, of Kippenross. 5. Notice of the Tallow-tree of China (*Stillingia sebifera*), lately introduced into the Punjaub. By William Jameson, Esq. 6. On Local Museums in the Punjaub. By Hugh Cleghorn, M.D. Dr. Cleghorn urges the formation of Local Museums throughout the Punjaub for exhibiting the native products of the country. 7. Notice of an Ash-tree struck by Lightning at Dunipace. By the Rev. Thomas Robertson. 8. Register of Plants in Flower in the open air at the Royal Botanic Garden. By James M'Nab, Esq.

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ON *CHARA ALOPECUROIDES*, *Del.*, AS A NATIVE OF BRITAIN.

By C. C. Babington, M.A., F.R.S., F.L.S.

(Plate VII.)

Unfortunately, a return of illness prevents my friend Mr. A. G. More from giving an account of his own most interesting discovery of *Chara alopecuroides*, Delile, in the Isle of Wight. Under these unhappy circumstances, he has requested me to draw up a short notice of the plant to accompany Mr. Fitch's drawing, the first ever published. Through Mr. More's liberality, I possess one of the very few specimens which he gathered. Another of them was sent to M. J. Gay, of Paris, who, many years since, gave it the manuscript name of *C. Pouzolzii*, in honour of M. Pouzolz, who discovered it in Corsica. It was found on July 10, 1842, at Perols, near Montpellier, by Dr. Wunderly, a pupil of the celebrated Dr. Alex. Braun, as we learn from parts of the original specimen most liberally sent to Mr. More by M. J. Gay. Mr. More found it "growing abundantly in the shallow water of the brine pans at Newtown, in the Isle of Wight," in August, 1862.

The plant seems, at the first view, to be a *Nitella;* but no true *Nitella* has involucral spines (and they are of great size in the present species), whilst all proper *Charæ* possess them at the base of the whorls. Also, the fruiting branchlets are forked (usually with 2 or 3 prongs) in *Nitella;* but in *Chara* they are simple with bracts at their joinings (nodes). By attending to these characters, there can never be any difficulty in deciding that such naked single-tubed plants as the present are *Charæ* rather than *Nitellæ*. I think also that the crown of the nucule of this species agrees with A. Braun's character of *Chara*, derived from its consisting of *one whorl of* 5 *persistent cells;* but of *two whorls, each of* 5 *cells, the one superimposed upon the other, and the whole deciduous* in *Nitella*.

This species is very closely allied to *C. barbata*, Meyen, but they seem to be quite distinct. *C. alopecuroides* is known from *C. barbata* by the basal joint (internode) of each of its branchlets being shorter, or at the utmost not more than equal in length to the second joint. *C. barbata* has an exceedingly long basal joint. Our plant also differs greatly in appearance from *C. barbata*, and might easily be taken, at the first

view, for *C. crinita;* but here the stem consists of a single tube, whereas there (in *C. crinita*) we find an outer coat of smaller tubes. *C. spinosa*, Amici, is stated to have "bracteis numerosissimis," which is all that I know about it; neither, apparently, was Wallman better informed. *C. macropogon*, A. Br., a plant of New Holland, is the only other species included in the same section, *Monosiphonicæ barbatæ;* but it has "nuculis in fundo verticilli congestis," and exceedingly long involucral spines "ramenta fere æquantibus, retrorsum adpressis." Thus our plant seems clearly different from all its near allies.

We know for certain that the plant found in the Isle of Wight is really the *C. alopecuroides*, Del., A. Br., by comparing it carefully with the authentic specimen sent by M. J. Gay (which also proves that it is the *C. Pouzolsii*, Gay, ms.), also with one in my own collection, given to me by the late Professor Henslow, as sent to him by Dr. A. Braun. These specimens are both from the neighbourhood of Montpellier. The same species has been found in Italy, Corsica, at Hvalöérne, on the coast of Norway, as far north as lat. 70°, and at Ulriksholms Fjord, Fyer, Denmark, from whence I possess beautiful specimens given to me by Fries in his 'Herbarium Normale,' xv. n. 99.

In addition to this evidence of the identity of our plant with that described by Braun and Wallman, we have the evidence of my highly valued friend J. Gay, contained in a letter recently addressed by him to Mr. More. He says: "Votre plante de l'île de Wight me paraît du reste parfaitement semblable à la mienne des côtes françaises de la Méditerranée, et M. Durieu de Maisonneuve, à qui je l'ai fait voir et qui est beaucoup plus compétent que moi en cette matière, M. Durieu, dis-je, en juge absolument de même." He adds that he desires "confirmer pleinement le jugement que M. Babington et vous avez déjà porté sur la plante dont il s'agit."

It remains only to point out the characters of the plant, which will be done upon a plan similar to that followed in the account of the other British species contained in my 'Manual,' ed. 5. Its discovery adds a new section of the genus to our flora.

Chara, *Agardh.*

Sect. 1. Monosiphonicæ. Stems composed of a single tube, smooth, unarmed, flexible, diaphanous.—*Barbatæ.* Involucral spines

long. Globule by the side of the nucule (pleurogynous), above the bracts.

C. alopecuroides, Del.; monœcious, stem rigid opaque, branchlets 3–5-jointed the lowest joint about as long as the second, involucral spines needle-shaped long patent or deflexed, bracts whorled 5–6 at each joining long equal, nucules with many striæ oval.

C. alopecuroides, *Delile, ms.; A. Br.! in Neue Denkschrift. der Allgem. Schweitz. Gesellschaft*, x. (1849) p. 13; *Regensburg. Botan. Zeit.* 1849, p. 134; *Wallm. in Kongl. Vetensk. Akadem. Handl.* 1852, 281; *Actes de la Soc. Linn. Bord.* xxi. 45; *Fries! Herb. Norm.* xv. 99.

C. Pouzolsii, *Gay, ms.!; A. Br. in Regensburg. Botan. Zeit.* 1835, i. 49.

C. barbata, *Fries, Summa Veg. Sc.* 60 (*non Meyen*).

A small, upright, opaque, dull brownish-green, slightly branched plant, usually less than 4 inches in height, but one of Fries's Danish specimens is double that length. Stem a simple tube like that of the *Nitellæ*. Our artist has unfortunately not represented the slender base of the plant. Involucral spines long, acute, declining. Whorled branches of 3–5 joints, or in some of the lower whorls of one long, blunt joint; all except the uppermost joints much inflated; the very last sometimes so small as to be hidden by its own whorl of bracts. The whorl of needle-shaped, erect-patent bracts at each joining, and the declining ones beneath the branches give this plant almost as spinous an appearance as the *C. crinita*, although its stems are without the spines which so abundantly arm that plant. The fertile branchlets usually have the lowest joint shorter than the second, although sometimes the first and second are equally long. The nucules and globules are solitary, but together and placed side by side above the whorl of bracts, in this respect differing from every other British *Chara*. The nucules are very small, oblong, with many (probably 11) striæ, very light-coloured, with the dark nucleus showing through the outer coat when ripe.

This plant should be found in brackish water on other parts of our coast. It is one of the most interesting additions that has recently been made to the flora of Britain.

Explanation of Plate VII.

Chara alopecuroides, Del., from specimens collected in the Isle of Wight by

A. G. More, Esq., F.L.S., and kindly communicated to us.—Fig. 1. The whole upper part a specimen magnified to about double the natural size. 2. Branchlet with nucule and globule. 3. Nucule. 4. Grains from interior of nucule. 5. Globule. 6. One of the bodies which fill the globule :—all, with the exception of fig. 1, highly magnified.

A BIPINNATE CYCADEA FROM N. E. AUSTRALIA.

By Berthold Seemann, Ph.D., F.L.S.

This plant, certainly the most singular Cycad brought into notice since *Stangeria*, with its Lomaria-like venation, was re-discovered by Mr. Walter Hill, Director of the Brisbane Botanical Gardens, and is to be called, after his Excellency Sir George Bowen, Governor of Queensland, *Bowenia*. It has the vernation of *Cycas*, the venation of *Zamia*. A living plant of it is now at Kew, and worth examining. The stipes is hirsute unarmed, and the leaf bipinnate and glabrous, the pinnæ being opposite, the pinnulæ alternate or opposite, unilateral, rhomboid-lanceolate, acuminate, serrated towards the apex, attenuate at the base. I possess a *Macrozamia* from N.E. Australia, with bifurcate leaflets, given to me by Mr. Charles Moore; but that is a very different plant. At first sight the leaf of this living *Bowenia* looks like a branch of *Geitonoplesium cymosum*, or some Dammara-like *Podocarpus*.

Bowenia, found by Mr. Hill on the banks of the Mackay, Rockingham Bay, N.E. Australia, was met with on the 2nd of July, 1819, by Allan Cunningham, one of whose specimens is preserved in the British Museum, another was given, many years ago, to Mr. J. Smith, of Kew. In a list of the plants A. Cunningham collected in the tropical parts of New South Wales, as Queensland was then called, and forwarded to Sir Joseph Banks, we read, under n. 289, the following:—"*Aroideæ*. A strong herbaceous plant appearing [to be] of this natural family, with 3-pinnate, obliquely elliptical, acute leaves (without fructification). Shaded woods, Mount Cook, Endeavour River. July 2, 1819. (Can this be a Fern?!)" On turning to n. 289 of the collection alluded to in the British Museum, I find a single frond, which is forked, and has below the forking two leaflets, but fifteen leaflets on each of the branches (*pinnæ*). The entire length of these branches is 18 inches. The leaflets are larger than those of the living plant at Kew, ovate-rhomboid, 5¼

inches long, 1¾ inches broad, and furnished at the outer edge with one tooth only. The fragment given to Mr. Smith seems to be the lower part of a frond, possibly broken off from the specimen now in the British Museum. There is little doubt that Hill's plant, gathered two or three degrees south of Endeavour River, is identical with that of Cunningham. But, as Cunningham's specimen is without the lower part of the stipes, it is impossible to determine whether it was a clerical error or not when he stated the leaves to be 3-pinnate. In Hill's very young living plant they are bipinnate, but it may be different in older specimens.*

CONTRIBUTION TO THE HISTORY OF AROIDEOLOGY.

By H. W. Schott, Ph.D.,

Director of the Imperial Gardens at Schönbrunn.

In the second edition of Linnæus's 'Species Plantarum' we have of *Aroideæ* only the genera *Arum*, *Dracontium*, *Calla*, *Pothos*, *Orontium*, and *Acorus*. With regard to the history of Aroideology, it might not be superfluous to recall and put on record a few facts relating to the origin of these six genera and their members, the time when they were first mentioned, their former nomenclature, and the changes of names rendered necessary by a close examination of these plants. At the same time it might be desirable to mention the well-known species which, on account of imperfect descriptions, were then (1763) not admitted, but have since been elucidated and referred to the Linnæan genera, now more accurately defined, or those genera separated from them.

The first-named genus (*Arum*) is characterized by Linnæus (Genera Plant., ed. 2, p. 441; 1742) thus :—"Spatha monophylla, basi convoluta. Spadix clavatus, marcescens supra germina. Filamenta nulla, nisi nectaria basi crassa, desinentia in cirros filiformes duorum ordinum e medio spadice egredientium dicas. Antheræ plurimæ, sessiles, cirrorum duplici ordini interjectæ. Germina plurima basin spadicis vestientia. Styli nulli. Stigma villis barbatum. Baccæ uniloculares.

* *Bowenia* is in Herb. Hook., under the name of *Dracontium podophyllum*, A. Cunn. Hb., but Cunningham gave that name to his specimen n. 288, which is a *Monstera*, and preserved in the British Museum.

Semina plura, subrotunda." This definition still holds good. The name "*Aron*," with the Greek termination, has been used in the most ancient times, but nothing is known respecting its etymology, it having been applied by Hippocrates (seculo v. ante Chr.), Theophrastus (seculo iii. ante Chr.), Dioscorides and Pliny (seculo i. post Chr.), but by the latter with the Latin termination (*Arum*). After the revival of scientific botany in the sixteenth century, Marcellus Vergilis (1518) was one of the first who employed the name for our *Arum (vulgare) maculatum*;* whilst many of the latter writers regarded *Arum*, *Aris*, *Dracontium*, *Dracunculus*, and *Arisarum* as synonymous. Brunfels (1530), the first who gave printed illustrations (woodcuts) of plants, also refers us to the just-mentioned *Arum*, still the type of the genus. The "*Aron*" of the ancients must probably be sought in what is now called *A. Byzantinum*, *Ponticum*, *marmoratum*, *Italicum*, or allied species, for, according to Dr. Kotschy, the young leaves of *Arums* are still seen in the markets of Constantinople. As former and ancient synonyms of *Arum* may be noticed *Jarus*, *Jarum*, *Gigarum*, *Sara*, *Harmiagrion*, *Cyperis*, *Mauriaria*, *Sigingialios*, and *Alimos*.

The Linnæan genus *Arum* contained, in 1763, 22 species, made known in the following chronological order:—*Arum Dracunculus*, *Colocasia*, *Arisarum*, *tenuifolium* (from the fifth century before Christ to the first century after Christ), *Arum maculatum* (Marcellus, Comment. 1518), *triphyllum* (C. Bauh. 1623), *pentaphyllum* (Zanon. Hist. 1675), *Dracontium* (Herm. Lugd. 1687), *macrorrhizon* (Herm. Parad. 1689), *trilobatum* (Herm. Parad. 1689), *esculentum* (Rumph. Amb. 1690), *ovatum* (Rumph. Amb. 1690), *sagittæfolium* (Pluckn. Phyt. 1692), *divaricatum* (Rheede, Mal. 1692), *arborescens* (Plum. Amer. 1693), *auritum* (Plum. Am. 1693), *hederaceum* (Plum. Am. 1693), *lingulatum* (Plum. Am. 1693), *seguinum* (Plum. Am. 1693), *proboscideum* (Bocc. Sic. 1697), *peregrinum* (L. Hort. Cliff. 1737), and *Virginicum* (Gronov. Virg. 1739).

But only one of these species, viz. *Arum maculatum*, agrees completely with the character assigned by Linnæus to the genus, a genus which comprises the *Arum vulgare non maculatum* (*A. immaculatum*, hodie), the *A. maculatum maculis candidis* (*A. Italicum ?*, hodie) *s nigris* (*A. maculatum*, hodie) of C. Bauhin. The other twenty-one species, widely diverging as they do from the generic type, have been

* Sprengel, Hist. i. p. 306.

referred to other, mostly newly-established genera. Thus, *Arum Dracunculus* now constitutes the genus *Dracunculus* (species *D. vulgaris*); *Arum Colocasia* is *Colocasia antiquorum ; Arum Arisarum* is *Arisarum vulgare* (exclusis reliquis *Arisaris* olim permixtis) ; *Arum proboscideum* is *Arisarum proboscideum ; Arum tenuifolium* is now called (exclusis reliquis speciebus commixtis) *Biarum tenuifolium* ; *Arum triphyllum, pentaphyllum*, and *Dracontium* belong to *Arisæma ; Arum seguinum* is the type of the genus *Dieffenbachia*, as *Arum macrorrhizum* is that of the genus *Alocasia. Arum trilobatum* and *divaricatum* are species of the modern genus *Typhonium. Arum esculentum* is now regarded as a variety of *Colocasia antiquorum*, produced by cultivation ; and *Arum ovatum*, again more carefully examined, constitutes the genus *Lagenandra. Arum sagittæfolium*, probably including several species, necessarily led to the establishment of the genus *Xanthosoma. Arum arborescens*, widely differing in its organs of fructification, had to be formed into a separate genus (*Montrichardia*), whilst *Arum auritum* became the type of the genus *Syngonium. Arum hederaceum* and *lingulatum*, plants climbing on trees, had to be separated from the true *Ara*, and received the appropriate name *Philodendron* (*hederaceum* and *lingulatum*). *Arum peregrinum*, known to Linnæus only from Cliffort's Garden, is in all probability nothing more than a young specimen of *Arum macrorrhizum* (*Alocasia macrorrhiza*), it being stated to have "folia peltata, usque ad petiolum cordata, . . . angulis rotundatis, . . . costis crassis instructa," which agrees with the *Alocasia* from Java, at that time cultivated in our gardens. *Arum Virginium* is in part *Peltandra Virginica.*

Respecting the synonyms of the above-named genera and species, as far as they belong to the period terminating with 1763, must be mentioned that *Dracunculus vulgaris* was formerly called *Serpentaria, Anguina, Dracontea*, and *Colubrina ;* that *Colocasia antiquorum* went by the name of *Arum Ægypticum*, and *Arisarum vulgare* (the Italian plant !) by that of *Arisarum latifolium. Biarum tenuifolium* was known as *Arisarum angustifolium ; Arisæma triphyllum* (*atro-rubens !*) as *Dracunculus* and *Serpentaria ; Arisæma pentaphyllum* as *Romphal* (Zanon.) ; *Dieffenbachia* as *Canna Indica venenata ; Typhonium divaricatum* as *Nelerischena major* (Rheede) ; *Lagenandra* as *Arum aquaticum* (Rumph.) ; and *Karinpola* (Rheede) and *Montrichardia* as *Aninga* (Piso).

However, investigations tend to show that many species already disco-

vered at that time (1763) were passed over, partly on account of insufficient description, partly from actual oversight. *Dracunculus* of Tournefort seems to include not only the best-known species (*D. vulgaris*), but also that from Crete (*D. Creticus*), perhaps also the *Helicodiceros crinitus* of the Balearic Islands (" In Gymnesiis insulis quæ Baleares vocantur, coctam radicem (*Dracunculi minoris*) cum melle multo, in conviviis placentarum loco offerunt." Matt. Comm. p. 408 ; 1570). It may even have embraced *Helicophyllum* (name derived from Cordus) : " *Dracontium* quod Græci vocant Latinis 'Dracunculus' appellatur, Arabibus 'Luff' et 'Alluff' (Matt. Comm. p. 411) ; Αρον quod autore Diosc. apud Syros 'Lupha' dicitur, folia emittit Dracunculi μικροτερα (Joh. Bauh. Hist. 784 ; 1651) ; *Dracunculus minor*, Arabis et Mauris 'Luph' (Rauwolff, It. i. c. ix. 115 ; 1573) ; Arisarum (et Aris) Plinio, lib. xxiv. c. 16, in Ægypto nascitur (Matth. Comm. p. 413 ; 1570)." The Egyptian plant would therefore be our *Arisarum Veslingii*, whilst the Greek *Arisaron* would be *Arisarum Sibthorpii*, and the Portuguese *Arisarum Clusii* (" latifolium in collibus Lusitaniæ frequens, . . . inde in Belgiam translata," Clus. Hist. lib. iii. p. 74 ; 1601) ; as, on the other hand, *Arisarum rotundifolium* of Boccone (Sic. 26 ; 1674) belongs to the genus *Ambrosinia*. Under the name of *Arum tenuifolium* is hidden not only the genus and Sicilian species (*Biarum tenuifolium*), but also the Dalmatian (*Biarum Anguillaræ*), the Greek (*Biarum Spruneri*), and perhaps also *Cyllenicum Spruneri*. The genus *Arisæma* would in those days have been found in the "Din-nan-scho" of Clyer (Valentini Histor.; 1680), and *Arisæma ringens*, the "Konjako" of Kæmpfer (Amœn. p. 786 ; 1712). The genus *Ischarum* was indicated in the *Arum Carsaami* of Rauwolff (1583) : i.e. *Calla orientalis*, Linn. *Theriophonum* was also discovered ; Klein having gathered it, as Willdenow's Herbarium, n. 17729, shows, during the years 1739–42. *Calyptrocoryne minuta* had been described and figured by Rheede in Hort. Malab. xi. p. 33, t. 17 ; 1692. *Typhonium Javanicum*, although published by Rumphius (Amb. v. p. 320, t. 110, f. 2) in 1690, remained unnoticed until our times. A similar fate befell the genus *Brachyspatha*, which Royen described (" fol. palmat. . . . spatham spadice breviorem superantibus ") in Hort. Lugd.-Bat. p. 7, t. 2 (1740), which Camelli (Stirp. Ins. Luzon. in Ray, Hist. pl. iii. App. p. 36, 13 ; 1704) mentioned as *Dracontium*, Luz. iii., and which Hermann (Hort. Lugd.-Bat. p. 60 ; 1698) had made known as *Arum polyphyllum Dra-*

cunculus and *Serpentaria dictum*, etc. Even *Conophallus*, already mentioned in 1692 by Rheede (Mal. xi. p. 37, t. 19), under the name of *Mulenschena*, and again noticed by Tournefort and Burmann (Fl. Zeyl. p. 90 ; 1737), was not classed amongst the sufficiently-known plants.

The plant which, according to Roxburgh, is called "Kundi" in Sanskrit, *Tacca phallifera* by Rumphius (Amb. v. 326, t. 113, f. 2 ; 1690) ; *Schena* by Rheede (Mal. xi. p. 35, t. 18 ; 1692) ; and *Arum polyphyllum Ceylanicum* by Commelyn (Hort. Amst. i. p. 99, f. 52 ; 1706),—the *Amorphophallus*,—was also completely overlooked in the 'Species Plantarum.' *Alocasia Indica* (*Arum Indicum*, Roxb. Fl. Ind. iii. 498 ; Wight, Icon. t. 794), which is identical with *Arum sylvestre* or *Arum Indicum sylvestre* of Rumphius (Amb. v. 310, t. 107), and of which we received living specimens from Java, and dried ones from Amboyna, collected by Doleschal, and accompanied by the remark, "Herba gregaria in umbrosis crescens, foliis ad 3′ altis, spatha pallide sulphurea," was not introduced in Linnæus's work, probably on account of the want of clearness in the representations, and the many vaguely-indicated subspecies, which could only lead to misconceptions and confusion. Nor were *Alocasia commutata* or *Leucocasia* admitted, both of which seem to have been known as cultivated plants, as would appear probable from Rumphius's description of *Arum Indicum sativum*, which is divided into *Arum sativum majus*, *Arum sylvestre*, and *Arum Ægyptium*, whose first division, *Arum sativum majus*, "iterum dividitur in tres species" (Rumph. l. c. p. 308), of which one "gerebat fructus spithamam longos ; quorum caudæ (spatha, spadix) albicant, uti et inferiora ipsorum ossicula seu granula (baccæ), quæ tandem sine rubedine marcescunt ;" the others "majoribus granulis Pisa referentibus. . . . Hæc nunquam penitus rubent, sed lutea sunt ; Arum sylvestre estque etiam in tres species subdivisum, latifolium, medium seu vulgare et aquaticum." Only *Alocasia macrorrhiza*, whose "flos albicat et odorem suavissimum spirat" (Herm. Parad. p. 73), whose petioli "inferior pars . . . sulcata est oris reflexis," whose "folii lamina costis crassis, robustis ac parallelis, ad inferiorem partem protuberantibus ad digiti crassitiem ;" of which is said, "quum superior ejus vaginæ (spathæ) pars sese aperiat, cauda ista fortem sed haud ingratum fundit odorem" (Rumph. l. c.), could be recognized, as afterwards confirmed by Forster (Pl. Escul. Ins. Austr. p. 58 ; 1786) and R. Brown (Prodr. N. H. p. 336 ; 1810), in "Arum maximum macrorrhizon" of Hermann, and

"Arum Indicum sativum," Rumphius, a "planta octo decemque pedes alta, cujus stipes pedis crassitiem habet" (Rumph. l. c.).*

Caladium, as the name is given by Rumphius, had also been discovered, having been known to Piso, 237 (1648). The same was the case with various species of *Xanthosomata*, which were mentioned by Thevetius (*vide* Sprengel, Hist. i. p. 375) about the year 1570, as "Caiou, espèce de Choux." A species of *Acontias* was already figured by Plumier (Cat. Pl. Amer. i. 8; 1693). *Arisarum esculentum* of Rumphius (Amb. v. t. xxx. p. 1; 1690), now called *Schismatoglottis longipes*, was known long ago as *Aglaonema oblongifolium* (according to Blume = *Arum aquaticum*, Rumph. Amb. v. t. 108; 1690); also *Aglaonema marantifolium* (= *Appendix erecta*, Rumph. Amb. v. t. 182, f. 2; 1690). Of the existence of *Homalonema rubra*, Hassk., Rumphius was fully aware, for he described and figured it under the name of *Dracunculus Amboinicus* (v. t. iii. p. 2).

Dracontium, the second genus taken up in Linnæus's 'Species Plantarum' (ed. 2) is characterized in the 'Genera Plantarum' (ed. 2, p. 442; 1742) in the following manner:—"Spatha cymbæformis, coriacea, univalvis, maxima. Spadix simplicissimus, cylindraceus, brevissimus, tectus fructificationibus in capitulum digestis, quarum singularum perianthium proprium nullum nisi corollam dicas. Corolla propria pentapetala, concava. Petala ovata, obtusa, fere æqualia, colorata. Stamina singulis filamenta 7, linearia, depressa, erecta, æqualia, corollula longiora. Antheræ quadrangulæ, didymæ, oblongæ, obtusæ, erectæ. Germen subovatum. Stylus teres, rectus, longitudine staminum. Stigma obsoletum, trigonum. Bacca subrotunda. Semina plurima." This definition does not hold good nowadays.

As has already been stated, the name "Dracontium" has been handed down to us by the ancient Greeks, and was given by Linnæus, as "Arum" was to be restricted to a different group of species, to one allied to *Arum*, for which Hermann (Parad. 93; 1689) had previously employed it. Earlier writers used however the name "Arum," as well as that of "Calla," for the group here described by Linnæus as *Dracontium*. When the second edition of the 'Species Plantarum' appeared (1763), *Dracontium* numbered five species, which may here be mentioned in chronological order. *D. spinosum* and *polyphyllum* are both described by Hermann (Parad. 75 and 93, t. 93), the former as "Arum

* As I had an opportunity to see in a living plant.

Zeylanicum spinosum," the latter as "Arum polyphyllum, caule scabro punicante," and "Dracontium, scabro puniceo caule, radice Cyclaminis." *D. pertusum*, collected by Plumier (Ann. 40, t. 56, 57), was made known in 1693; *D. fœtidum* (Gron. Virg. i. p. 186) in 1739; and *D. Camtschatense* (Linn. Amœn. ii. p. 360) in 1751. But of all these *Dracontia* there is only one, the *Arum polyphyllum* of Hermann, which properly belongs to the Linnæan genus *Dracontium*, and of which until now only one species is known. All the others had to be renamed, as their organs of both vegetation and fructification differ essentially. Thus *D. spinosum* was called *Lasia Hermanni*; *D. pertusum*, *Monstera Adansonii*; *D. fœtidum*, *Symplocarpus fœtidus*; and *D. Camtschatense*, *Lysichiton Camtschatense*. There is but little to add to the first-mentioned *Dracontia*. As synonyms of *D. polyphyllum* none can be quoted with certainty, except those already cited by Linnæus. Of *Monstera* several species may have been known in those days, but too imperfectly to be intelligible. Catesby called *Symplocarpus* "Arum Americanum betæfolio;" Gronovius "Calla aquatilis, odore Allii," etc.

Calla, the third genus of *Aroideæ* known to Linnæus in 1763, and to the earlier writers, though not under that name, is characterized (Gen. ed. ii. p. 440; 1742) in the following terms:—"Spatha monophylla, ovato-cordata, superne colorata, maxima, patens, persistens. Spadix digitiformis, simplicissimus, erectus, fructificationibus tectus. Corolla nulla. Stamina filamenta nonnulla, germinibus intermixta, longitudine pistillorum, persistentia, compressa, truncata. Antheræ simplices, truncatæ, sessiles. Pistilla singula constant germine subrotundo, obtuso, stylo simplici brevissimo, stigmate acuto. Baccæ totidem, tetragono-globosæ, pulposæ, uniloculares. Semina plura, oblonga, cylindricea, utrinque obtusa." In additional observations he says, "In aliis speciebus spadix tegitur totus staminibus et pistillis mixtis. In aliis vero inferius tantum, superius autem solis staminibus tectus," which shows that Linnæus thought there might be a generic difference of the plants collected under *Calla*, which was afterwards fully confirmed.

It cannot be ascertained with certainty when the name *Calla* was first given. Its Greek derivation seems to be undoubted, but it must be added that Linnæus (Phil. Trans. ed. 2, p. 197; 1763) ascribes it to Pliny. Other names belonging here are, *Hydropiper rubeum* of Fuchs, 1532 (*vide* Sprengel, Hist. i. p. 327); "Dracunculus aquaticus," Matth. Comm. p. 409 (1570); "Anguina aquatica" sive "Dracunculus

arundinacea radice Plinii," Lobel, Stirp. Obs. p. 328 (1576); "Arum Æthiopicum," Herm. Lugd.-Bat. 60 (1687); "Arum aquaticum," Johren hodeg. 32 (1710); and "Provenzalia palustris," Petit, Gen. 45 (1710).

Three species of *Calla* were enumerated by Linnæus, viz. *C. palustris*, *orientalis*, and *Æthiopica*: the first known since Pliny's, the second since Rauwolff's (It. H. 8; 1573), and the third since Hermann's times (Lugd.-Bat. 60; 1687). But this genus, too, retains at present only one species, *C. palustris*, to which alone the definition given does apply. *C. Æthiopica* is the type of the genus *Richardia*, and *C. orientalis* was referred to *Ischaris* as *I. Carsaami*, under which appellation it is popularly known in its native country. As a synonym of *Calla Æthiopica* (*Richardia Africana*) must be mentioned *Arum Americanum*, "Ari vulgaris facie, foliis carnosis," of Micheli (Cat. Pl. Hort. Florent. 9, t. 2; 1748), as taken up by Linnæus in the 'Species Plantarum.' *Calla aquatilis* of Gronovius was referred by Linnæus to *Dracontium fœtidum*, the *Symplocarpus fœtidus* of the present day, to which it properly belongs.

Pothos is the fourth genus under consideration, and its character must be sought in Linnæus's 'Flora Zeylanica,' nova genera, p. 13 (1747):—"Call. spatha globosa, monophylla, altero latere hians. Spadix brevis, simplicissimus, reflexus, globosus, tectus fructificationibus sessilibus. Perianth. 0, nisi corollam sumas. Cor. petala 4, cuneiformia, oblonga, erecta. Stam. filamenta 4, latiuscula, erecta, petalis angustiora, ejusdemque longitudinis. Antheræ minimæ. Pistilli germen parallelepipedum, truncatum. Stylus 0. Stigma acuminatum. Pericarpium. Baccæ aggregatæ." In the fifth edition of the 'Genera Plantarum,' p. 415 (1754), is added, "(Baccæ aggregatæ) subrotundæ, 1-loculares. Semen unicum;" which may be termed truth mixed with error. The first mention of the true *Pothos* is found in Theophrastus (H. p. vi. 7). The plant thus designated remained unknown to us; and it is only the similarity of sound of the Cingalese name, "Potha," of the species first made known, that led to the re-application of the Greek word. As early as 1688, Rheede had represented the habit of the genus; also Rumphius in 1690; but total want of any description of the structure of flower and fruit prevented the elucidation of its relationship. Rheede mentions the genus under the name of *Anaparua* (Hort. Mal. vii. t. 40); Rumphius under *Appendix duplofolio* seu

"Tapanava Kitsjil" (nomen Amboinense) (Amb. v. p. 490, t. 184, f. 1, 2, 3). Linnæus, availing himself of the description given by Burmann (Thes. Zeyl. 197 ; 1737), founded, ten years later, the genus *Pothos*, to which, in 1763, he referred six species, viz. *P. lanceolata*, *crenata*, *cordata*, *pinnata*, *palmata*, and *scandens*. Of these, however, only the species first made known, and placed last in the 'Species Plantarum' (*P. scandens*), is a representative of the genus *Pothos*. All the other species are representatives of other genera. Thus *P. lanceolata*, *crenata*, *cordata*, and *palmata* are the first-known species of *Anthurium* ; whilst *P. pinnata* is the earliest-known *Rhaphidophora*. Three genuine species of *Pothos*, though figured and described by Rumphius, were by an oversight not inserted in the 'Species Plantarum,' ed. 2, viz. *P. tener* ('Appendix arborum prima,' Amb. v. t. 181, f. 1), *P. macrostachyus* ('Ap. arborum altera,' Amb. v. t. 181, f. 2), and *P. Rumphii* ('A. porcelianica,' Amb. v. t. 182, f. 1), one of the three species still amongst the least-known *Aroideæ*. "Appendix laciniata" (Amb. v. p. 489, t. 183, f. 2) is a synonym of *Rhaphidophora pinnata* "Elletadi Maravara" (Rheede, xii. t. 20, 21 ; 1703), a second species of *Rhaphidophora* (*R. pertusa*). Unnoticed were "Appendix Cuscuaria," of Rumphius (Amp. v. t. 183, f. 1) ; *i. e.* what now is termed *Cuscuaria marantifolia*. Plumier's generic names for the above-named *Anthuriums* were *Arum*, *Dracontium*, *Dracunculus*.

There is hardly anything to remark about *Orontium*, the fifth genus of *Aroideæ* of the second edition of the 'Species Plantarum,' which, although discovered by Banister and described by Ray as early as 1704, was only admitted in 1756 in the 'Amœnitates,' vol. iii. Up to this time we know only one species.

Nor is there much to say respecting *Acorus*, the sixth and last genus of Linnæus's work. The generic character in the second edition of the 'Genera Plantarum,' with a few unimportant alterations, still holds good. Theophrastus, and even Hippocrates, called it Κάλαμος ; the 'Flora Biblica,' "Kone Hatof" (*Calamus aromaticus ?*) ; but Dioscorides seems to have been the first who used the name "Acorus." In 1763, Linnæus described only one species (*A. Calamus*), but distinguished the plant common with us from that of Indian Asia. In recent times it has been ascertained that several species occur in India and the adjacent countries, and as the species enumerated by Rumphius (Amb. v. p. 178, t. 72) and Rheede (Mal. xi. p. 99, t. 60 ; 1692) are not yet

sufficiently elucidated, it is still a question what names these species should bear. Rumphius called his plant "Acorum;" Rheede used the native name, "Waembu;" Petit (Gen. 49; 1710) thought it desirable to retain the old appellation, *Calamus aromaticus.*

Thus, in 1763, Linnæus enumerated 6 genera and 38 species; to-day, just one hundred years later, we have 116 genera, and from 1044–50 species of *Aroideæ.*

THE SOLANA OF TROPICAL POLYNESIA.

By Berthold Seemann, Ph.D., F.L.S.

On finally determining the *Solana* of Viti for my forthcoming Flora, I was led to examine all the other Nightshades inhabiting the tropical parts of Polynesia, and preserved at the British Museum and in the herbaria of Sir W. J. Hooker and Mr. Bentham. They amount to fifteen species, only seven of which were given in Professor A. Gray's recent Polynesian list.*

* *Armata.*

1. *S. incompletum*, Dunal, in De Cand. Prod. xiii. sect. i. p. 311.—Hawaii (*Nelson! in Mus. Brit.; Remy, n.* 451, *fide A. Gray*).

There are two specimens of this, without flower and fruit, at the British Museum, which Dunal provisionally named *S. Sandwichianum*, a name afterwards cancelled.

2. *S. xanthocarpum*, Schrad. et Wendl. Sert. Hanov. i. p. 8. t. 2.—Oahu, Sandwich Islands (*Barclay! in Mus. Brit.; Seemann! n.* 1721), where it is called "Kikania."

Probably introduced from India. The plant is about two feet high, and in my notes I call the berries scarlet. The calyx is clad with large straw-coloured spines.

** *Inermia.*

3. *S. Vitiense*, Seem. Flora Vit. ined. (sp. nov.)—Fiji Islands (*Seem. n.* 340).

* There is a generic term for these plants wherever the Polynesian language is spoken, including New Zealand, viz. "Boro," "Poro," or "Poroporo," as the different dialects have it.

A tree. Allied to *S. membranaceum*, Wall. (*S. subtruncatum, Wall.*), but calyx quite truncate, and without those minute teeth found in that of *S. membranaceum.*

4. *S.* (§ *Morellæ veræ*) *Forsteri*, Seem.; herbaceum, annuum, breviter villoso-tomentosum demum glabrescens, caule inermi vix angulato geniculato-flexuoso, foliis ovatis acuminatis integerrimis v. sinuato-dentatis basi cordatis v. in petiolum attenuatis, cymis extra-axillaribus 3–6-floris, pedicellis cernuis, calycis laciniis ovatis acutis, corolla extus tomentella, bacca globosa glabra pisi magnitudine.—S. nigrum, *Forst. Prodr. n.* 106, *non Linn.*—Easter Island (*Forster! in Herb. Mus. Brit.*), Tahiti (*Nelson! ; Sir J. Banks!*), Vavao, Friendly Islands (*Barclay!*).

This species is much nearer to *S. villosum*, Lam., than *S. nigrum*, Linn., but the leaves are generally less deeply cut than they are in *S. villosum*, and in only one specimen, collected by Sir J. Banks in Tahiti, do there occur any deep indentations. Forster's specimen, from Easter Island, is much more hairy than the Tahitian or Tongan specimens. The flowers and berries are much smaller than in the true *S. nigrum.* Solander, in his MS. volume, included the Tahitian specimens under the name of *S. rubrum*, but he describes the berry as black.

5. *S. oleraceum*, Dun., in De Cand. Prod. xiii. sect. 1, p. 50. Nomen vernaculum Vitiense, "Boro ni yaloka ni gata."—Viti Islands (*Seemann! n.* 344), Sandwich Islands (*Nuttall! in Mus. Brit.*), Norfolk Island (*Milne! in Herb. Hook.*), Society Islands (*Banks and Solander!*). I have also seen it wild about Sydney.

S. astroites, Forst., from the Society Islands, may ~~positively~~ be a synonym of this species. Forster has left no description, drawing, or specimen of it; but when it is borne in mind that there are only four species of *Solanum* from the Society Islands, viz. *S. Uporo*, *S. repandum*, *S. Forsteri*, and *S. oleraceum*, and that we know Forster could not mean the first three, having previously described them, there is little doubt that his *S. astroites* is identical with *S. oleraceum.*

6. *S. amicorum*, Benth. in Lond. Journ. of Bot. vol. ii. p. 227; De Cand. Prod. xiii. sect. 1, p. 269.—Tongan Islands (*Barclay! in Mus. Brit.; United States Expl. Exped.! in Herb. Benth.*).

7. *S. puberulum*, Nutt. mss. in Herb. Brit. Mus.; fruticosum, ramis junioribus furfuraceo-tomentosis demum glabratis, foliis geminis, altero multo minore, ovato-oblongis acuminatis integerrimis vel sinuato-

lobatis, lobis acutis, basi obliquis, utrinque furfuraceo-puberulis, ante evolutionem ochraceo-tomentosis, floribus extra-axillaribus simpliciter racemosis, pedicellis gracilibus, calycis lobis subulatis corolla tomentosa fere 5-partita 3-4-plo brevioribus, baccis globosis glabris nitidis ($\frac{3}{4}$ unc. diametr.).—S. puberulum *et* pulverulentum, *Nutt. mss. in Herb. Brit. Mus.*—Oahu, in silvis montosis (*Nuttall!*), Sandwich Islands (*Menzies! in Herb. Mus. Brit.*).

This is very near *S. Sandwichense*, Hook. and Arn., and *S. tetrandrum*, R. Brown, but differs from both in not having divaricate cymes but simple racemes. It is far less tomentose than *S. Sandwichense*, the leaves, when fully developed, being quite glabrous on both sides, as are also the fruiting peduncles and pedicels. Larger leaves, including petiole, 4–5 inches long, 2 inches broad; fruiting pedicels 1 inch long.

8. *S. Bauerianum*, Endl. Fl. Norf. p. 54.—Norfolk Island (*Herb. Hook.*).

Very near *S. Uporo* and *S. viride*, Br., but corymbs generally terminal and corolla glabrous.

9. *S. Uporo*, Dun., in De Cand. l. c. p. 138.—S. anthropophagorum, *Seem. in Bonpl.* x. *p.* 274, *t.* 14. S. viride, *Sol. (non R. Brown!) mss. in Forst. Plant. Esculent. n.* 42; *Forst. Prodr. p.* 89, *n.* 507 (*sine descript.*); *Parkinson's Drawings of Tahitian Plants in Mus. Brit. t.* 27. S. aviculare, *Guill. Zeph. Tait. p.* 45 (*non Forst.*). Nomen vernaculum Tahitense, "Poroporo;" Vitiense, "Boro dina."—Viti Islands (*Seemann! n.* 341, *Milne!*), Society Islands (*Nelson!*), Tongan Islands (*Barclay!*), Samoan Islands (*Sir E. Home!*), New Caledonia or Friendly Islands (*Forster! in Mus. Brit.*).

R. Brown's *S. viride* differs from this species in having styles longer than the stamens and berries not larger than a good-sized pea, whilst *S. Uporo*, Dun., has styles *shorter* than the stamens, and berries having the dimensions of tomatoes and the larger olives. Solander's *S. viride* being merely a name, unaccompanied by a description, that of R. Brown, free from this defect, naturally has the preference. Dunal's *S. Uporo*, described from insufficient materials, was at first not recognized by me, or else I should not have added the name *anthropophagorum* to its synonymy. *S. aviculare*, Forst. (with which Hook. fil. very properly unites *S. laciniatum*, Ait.), is very different from *S. Uporo* (the "Poroporo" of Tahiti, "Boro" of Viti), and does not occur in the Society Islands; Guillemin meant *S. Uporo* by his *S. aviculare*.

10. *S. tetrandrum*, R. Brown, Prodr. i. p. 445.—S. inamœnum, *Benth. in Lond. Journ. Bot.* ii. p. 228.—Viti (*Seemann! n.* 343 *et* 345, *Milne!*, *Hinds!*, *Barclay! United States Expl. Exped. in Mus. Brit.*, *Herb. Hook. et Benth.*), East coast of New Holland (*R. Brown!*).

Some of R. Brown's authentic specimens have pentamerous flowers, and I cannot find any characters to separate them from *S. inamœnum.*

11. *S. Nelsoni*, Dunal, in De Cand. Prod. xiii. sect. 1, p. 123.—S. rotundifolium. *Nutt. mss. in Mus. Brit. et Herb. Hook.!* S. argenteum, *Hook. et Arn. Bot. Beech. p.* 92?—Kauai (*Nuttall! in Herb. Hook. et Mus. Brit.*), Oahu (*Remy, n.* 442, *fide A. Gray*).

I have compared Nuttall's specimen of *S. rotundifolium* with the original one of Nelson, at the British Museum, and there can be no doubt of their being identical. But I do not find in Sir William Hooker's herbarium the specimen, mistaken by the authors of Beechey's Botany for *S. argenteum*, which A. Gray hesitatingly refers to *S. Nelsoni.* Nor has Prof. Walker Arnott, as he informs me, a specimen of it.

S. Nelsoni, Dun., var. *thomasiæfolium*, Seem.; foliis cordato-ovatis sinuato-lobatis, lobis (5–7) obtusis, vel cordatis integris, fructu globoso glabro pisi magnitudine.—S. vestitum, *Nutt. mss. in Herb. Mus. Brit.* —Atoi (*Nuttall! in Herb. Mus. Brit.*).

This has quite the look of *Thomasia solanacea*, Gay, and would probably be described as a new species by any one not having seen the evident transition there is in some specimens of what Nuttall has called *S. rotundifolium* and A. Gray justly considers identical with the original *S. Nelsoni*, Dun., preserved in the British Museum. In these specimens some of the leaves have a tendency to become sinuato-lobate, whilst again several leaves noticed in my var. *thomasiæfolium* are cordate and entire. The resemblance between *S. Nelsoni* var. *thomasiæfolium* and *Thomasia solanacea* is quite as striking as that between the Amazonian moth and the humming-bird figured in Mr. Bates's Travels on the Amazon.

12. *S. Austro-Caledonicum*, Seem. (sp. nov.); fruticosum, erectum, inerme, foliis ovato-oblongis acuminatis integerrimis, basi obliquis, supra pubescentibus, demum glabris, subtus ramulis pedunculis calycibusque dense tomentosis, corymbis extra-axillaribus bifidis multifloris, calycis 5-fidis, laciniis triangularibus acutis, corollæ laciniis lineari-

lanceolatis extus dense tomentosis, stylo staminos superante, bacca globosa lævi glabra pisi magnitudine (v. s. sp.).—Loyalty Islands (*Sir G. Grey, in Herb. Hook.*), New Caledonia (*Sir E. Home!*), Isle of Pines (*Milne!*).

A shrub, from 12–14 feet high. Leaves from 4–5 inches long, 1–1½ inches broad. Corolla exceeding the calyx 3 or 4 times in length. Fruiting peduncle swollen towards the apex. The nearest ally of this species is *S. Sandwichense*, Hook. et Arn., but the lobes of the corolla are linear-lanceolate almost subulate, whilst those of *S. Sandwichense* are ovate-acuminate.

13. *S. Sandwichense*, Hook. et Arn. Bot. Beech. p. 92.—S. Woahense, *Dunal, in De Cand. Prod.* xiii. *sect.* 1, *p.* 268.—Oahu (*Beechey!*, *Seemann! n.* 2273, *in Herb. Hook.*; *Macrae!*; *Hinds! in Herb. Benth.*; *Nuttall!**); Atoi (*Barclay! in Mus. Brit.*).

Var. (?) *β*, *Kavaiense*, A. Gray, Proceedings Amer. Acad. vi. p. 43. —Kauai (*U. S. Expl. Exped.*); Oahu (*Barclay! in Mus. Brit.*).

14. *S. Milnei*, Seem. (sp. nov.); fruticosum, erectum, inerme, ramis pedunculis pedicellisque cano-tomentosis, foliis solitariis elliptico-lanceolatis utrinque longe acuminatis v. ovato-acuminatis, irregulariter et minute undulato-crenatis, basi inæquilaterilibus, supra adsperso-pilosis demum glabris, subtus cano-tomentosis, floribus dichotomo-cymosis extra-axillaribus vel terminalibus, cymis divaricatis multifloris, calycis laciniis cuspidatis, corollæ 5-fidæ tomentosæ laciniis lanceolatis, antheris apice 2-porosis, stylo staminos superante, basi pilosi, bacca globosa glabra (v. s. sp.).—Island of Futuna, New Hebrides (*Milne! in Herb. Hook.*), Aneitum (*Milne!*, *Macgillivray!*).

"A shrub, 5 feet high" (*Milne*), and "generally growing in clumps in waste places" (*Macgillivray*). Leaves with long petioles, and 6–7 inches long and 2 inches broad. Flowers apparently white. The fruit on the specimens I have seen not quite ripe.

15. *S. repandum*, Forst. Prodr. n. 105; Forst. Icon. t. 59, 60.—S. latifolium, *Parkinson's Drawings of Tahitian Plants, t.* 28, *in Mus. Brit.* S. Quitense, *Hook. et Arn. Bot. Beech. p.* 67 (*non Lam.*).—Nomina vernacula Vitiensia, "Boro sou" v. "Sousou."—Pitcairn Island (*Cuming! n.* 1382), Tahiti (*Sir J. Banks!*, *Wills, and Smith!*,

* *S. Californicum*, Dun. in De Cand. Prod. xiii. sect. i. p. 86, collected by Nuttall at Monterey, California, is identical with *S. Menziesii*, Dun. l. c. p. 159, collected in the same locality by Menzies: both specimens preserved in the British Museum.

Hinds!, *Barclay! United St. Expl. Exped.!*), Marquesas Islands (*Mathews! n.* 93, *Barclay!*); Viti (*Seemann! n.* 341).

REPORT TO THE UNDER SECRETARY OF STATE FOR INDIA ON THE BARK AND LEAVES OF *CHINCHONA SUCCIRUBRA* GROWN IN INDIA.

By J. E. Howard, Esq., F.L.S.

Communicated by Clements R. Markham, Esq., F.S.A., F.R.G.S.

[The propagation of the different species of Chinchona, introduced into India by Mr. Markham, has been so eminently successful in the Neilgherries, under the able superintendence of Mr. M'Ivor, that thousands of young plants can now be supplied to the public. By order of the Government of Madras, Mr. M'Ivor has published, for the guidance of those about to embark in the cultivation of Peruvian bark for commercial purposes, an octavo pamphlet of 22 pages, illustrated by woodcuts, and entitled 'Notes on the Propagation and Cultivation of the Medicinal Chinchonas, or Peruvian Bark-trees,' the plain, clear instructions of which cannot fail to fulfil the purpose for which they are intended. Mr. M'Ivor deserves great credit for the discovery that Chinchonas readily grow from buds, into the details of which he enters, and the practical value of which has been so unmistakably demonstrated. Mr. Howard's excellent official report on the first bark gathered on Mr. M'Ivor's plantations will effectually dispel the fear that the Chinchonas grown artificially in India might not contain the same alkaloids as those produced spontaneously in South America, whilst the discovery of quinine, etc., in the leaves of the red bark has an importance which physiologists will know how to appreciate.—Ed.]

I have the pleasure of reporting that the specimens of Chinchona bark and wood, together with dried leaves, and decoction made from the same, which were forwarded from the Neilgherry Hills, in Southern India, by Mr. M'Ivor, reached me in good order on the 23rd of May last, and that I have since submitted them to careful examination.

The appearance of the bark indicates that it has been gathered and dried under favourable circumstances. It is full of sap, which, in some cases, exudes a little at the cut ends, and forms what is called a resinous ring or circle. The specific gravity is considerable, and the thickness, especially of the fifteen months old bark, is remarkable for the time of growth, being about one-tenth of an inch in some of the quills, which curl much in upon themselves in drying. The external surface is

warty, and the colour more of a tea-green than is usual in the bark as it is imported from South America, but, as it is not cut there at so early a stage of growth, it is difficult to form an accurate comparison in this respect. The taste is that of "red bark," being compounded of the bitter of the alkaloids and the more nauseous taste of kinovic acid. The powder resembles that of good Peruvian bark.

In order to make the best analysis of the small quantity of bark at my command, I commenced with five hundred grains of that of the second year's growth, and was able to obtain therefrom a first and second crystallization of white sulphate of Quinine. By thus specifying the whiteness, I mean to imply that the bark had not the commercial disadvantage which frequently attends the "red bark" at a more mature stage of growth, resulting from the fact that the colouring matter has in these last become so much implicated with the alkaloids as to make the task of purification a difficult one. The crystallizations I obtained were mixed with some sulphate of Chinchonidine, which is commercially (but not medicinally) a disadvantage, and one which always attends the products of "red bark." I also obtained Chinchonine, and other usual products of the process as from South American bark, viz. kinovic acid, kinate of lime, gum, chinchona red, etc. The product of alkaloid in a rough state was estimated at 4·30 per cent. A second trial of the same quantity enabled me to decide more accurately the percentage product in *purified* alkaloids. I found the total contents 3·30 to 3·40 per cent., and of this (soluble in ether) Quinine and some Chinchonidine 2·40 per cent., leaving ·60 per cent. of Chinchonine, which crystallized freely, and also ·30 or ·40 loss chiefly in water of the hydrated alkaloids. This result must be considered extremely favourable.

I have noticed the product of some fine quills of South American red bark as 3·60 per cent.,* the larger bark of the same parcel producing 3·91 of alkaloid. Dr. Riegel obtained from one ounce red bark, of best quality, 4·16 per cent. by Rabourdin's process, or 3·90 by that of Buchner. Of this, 2·65 per cent., soluble in ether, was reckoned as Quinine, and the rest was set down as Chinchonine.† I have obtained a much higher percentage of alkaloid from large and peculiarly fine "red bark," but I see no reason to doubt that even this higher per-

* 'Illustrations of Nueva Quinologia,' under head "*C. succirubra*," p. 15.
† Pharm. Centralblatt, for July, 1852.

centage would be attained in the East Indies, if time were allowed for the growth.

The exact period at which it would be advisable to cut the bark must be ascertained by experiment, but I think this should take place as soon as the bark attains to a thickness which would repay the cultivation. There would be positive disadvantage in allowing the bark to attain such an age as is indicated by many of the specimens from South America, if the object to be attained is the extraction of the alkaloids; since there is a continual process of deterioration* of these after a certain period of the history of the bark, which is connected with the oxidation of the red colouring-matter, and the production, in very old trees, of those fine descriptions of bright red bark which command indeed a high price in the market (as much at the present time as eight shillings per pound), but which would not, in many cases, be more valuable for the production of Quinine than bark of one year's growth.

I next examined the younger bark of one year's growth, taking care to select the most mature portion, and found that it yielded 2·59 of alkaloid, of which 2·55 (soluble in ether) appeared to be Quinine and Chinchonidine, and in part crystallized into tolerably white sulphate, which showed perhaps a rather larger proportion of Chinchonidine than in the older bark. On the other hand, the proportion of Chinchonine seemed notably less, viz. only 0·04 per cent., but it is possible that the separation was not exactly effected between the Chinchonine and Chinchonidine, which is not easily accomplished by ether in such small portions.

The above result induced me to pay further attention to the leaves, concerning which the absence of any carmine sublimate by heat led me at first to an unfavourable conclusion. The decoctions and infusions made by Mr. M'Ivor, though in perfectly good condition, showed that the contents changed most rapidly under the influence of the oxygen of the atmosphere as soon as ammonia was added to the, at first, decidedly acid liquor. Fortunately, a good supply of several ounces of dried leaves had been sent over, and from these I succeeded in obtaining Quinine, though in very small quantity, but presenting its usual characteristics, dissolving in acids and precipitated by alkalies as a whitish hydrate, soluble in ether, and left by this on evaporation as a

* Described in my 'Illustrations of Nueva Quinologia,' under head "*C. succirubra*," p. 14.

resinous-looking body, having the usual bitter taste, also crystallizing not only as a sulphate, but as an oxalate of Quinine (the latter being the more critical test), but nevertheless presenting a characteristic implication with resinous or extractive matter, such as is usually met with in the very smallest quills or *canutillos* of South American bark, in analysing which it is frequently difficult to purify the Quinine from this adhesion. I obtained first from these leaves to the extent of 0·11 of alkaloid,* of which part was soluble in ether, the remainder in spirits of wine, and afterwards 0·19 of precipitate still more combined with astringent matter. From these data, it seems to follow that the leaves will not supply a material for the extraction of Quinine, but that they will, nevertheless, be very useful when used fresh or in recently-prepared decoction or infusion for the cure of the fevers of the country. To this end the abundance of kinovic acid they contain, equal (weighed in the rough state) to 4·20 per cent., may also conduce.

I have not much to remark as to the No. 3 (bark renewed over spaces previously cut), as the quantity sent was too small for much chemical examination, but I obtained abundantly by heat the crimson sublimate which marks the presence of alkaloids, and the promise from the external characteristics was good. The No. 4 bark (covered up with moss for some months) seems to me a successful experiment of Mr. M'Ivor's, especially since I notice very abundantly in this bark the crystals of kinovate of Quinine, which I have described† as I found them in the "red bark" of South America, and now find again, quite as plentifully, in the older bark sent from India. I may add, generally speaking, the structure of the barks as shown by the microscope makes it evident that the plants had grown vigorously and under circumstances favourable to their full development.

I reserve any opinion as to the best method of drying the bark, to which Mr. M'Ivor alludes, till I have had the opportunity of examining further specimens.

* The green leaves, *dried in the shade*, have *since* yielded me 0·20 of alkaloid, soluble in ether, and traces of Chinchonidine (forming a resinous hydriodate), and Chinchonine.—*J. E. H.*

† 'Illustrations of Nueva Quinologia,' Mic. Obs., p. 7.

CORRESPONDENCE.

Quinine, Chinchonidine, and Chinchonine, in the Leaves of Chinchona succirubra.

Tottenham, June 20, 1863.

A few remarks of a technically scientific nature on some points which struck my attention in making the investigation detailed in my official report on the red bark grown in South India, may not be unacceptable. The discovery of Quinine, Chinchonidine, and Chinchonine, in the leaves of the *Chinchona*, seems to confirm the views which I have expressed as to the production of the alkaloids by a reaction taking place between the mother-substance found in the heart-wood and carried up into the leaves by the circulation of the sap, and the ammonia which, according to the observations of De Vry, is present in every part of the plant. This mother-substance, forming a yellow solution in ether, separates in a flocculent mass by the addition of quinine, and the semicrystallization thus induced formed on recrystallization the crystals which I have described and figured as similar to those found *in situ* in the bark itself. The Chinchona-red appears to be formed at the same time, and colours the flocculent mass reddish, or rather pink. I find in the leaves abundance of kinovic acid, which, separated from adherent chlorophyll, becomes perfectly white and similar to that obtained from the bark; they also yield much wax and kinate of lime, together with gum. In order to check or confirm the trial of the leaves, I also examined with similar results the hollow square stalks (received, with other parts of the tree, from Ecuador) just below the insertions of the leaves. This gave a similar but rather less minute quantity of quinine, and also of an alkaloid not soluble in ether. I conclude that the process of the formation of the quinine goes forward still in the bark, though begun in the leaves, and continues to increase with the increasing maturity of the bark, undergoing afterwards the deterioration above spoken of. If such be at all the process, the alkaloids must be found in the sap itself; and if the quinine be formed in the leaves, in which there are certainly no liber-fibres, it seems to me to dispose of the hypothesis that these latter are in some way *essential* to the formation of the alkaloids. The above discovery also coincides with the presence of quinine (as I have shown) very eminently in the cellular tissue of the outer bark, which is evidently, in the barks under consideration, gorged to repletion with sap. Reserving any remarks on the microscopic peculiarities in these East Indian barks for some further occasion, I remain, yours, etc.,

JOHN ELIOT HOWARD.

Bryological Notes.

Rose Hill, Bowdon, Cheshire, June 24, 1863.

I have discovered a second British locality for *Sphagnum laricinum*, Spruce, described by Wilson as *S. contortum*, var. *laricinum*. In general aspect this

plant resembles *S. Mougeotii* (*S. cuspidatum*, var. *recurvum*, Wils. Bry. Brit.) more than *S. contortum*, and, like *S. Mougeotii*, has the leaves undulate at the margin when dry, and also recurved, though to a less extent than in that species. Its structure is described in the Bry. Brit. as allied to that of *S. contortum*, but differing in the very minute pores of the leaves, and also in having the cortical layer of the stem composed of two or even three rows of cellules. The stem is dark in colour. No fruit has yet been found. The station where it occurs here is Carrington Moss, about five miles from Manchester, on which place it grows in considerable abundance.

In 1860 I gathered *Bartramia rigida* on the cliffs near Criccieth, North Wales, in a shady crevice, growing in the same tuft with *Bartramia pomiformis*. I think this is the first English station recorded.

I shall be happy to furnish fruiting specimens of *Hypnum fluitans*, *H. Kneiffii*, and *H. exannulatum*, and barren ones of *H. revolvens*, *H. aduncum*, Hedw., *Sphagnum laricinum*, and *S. Mougeotii*, to those who wish for them.

George E. Hunt.

The new Purple Trefoil of the Scilly Islands.

Oakfield, Leamington, June 3, 1863.

My first impression on seeing this lovely trefoil in the Scilly Islands was that it might be distinct from *Trifolium repens*, and I gathered several specimens, making, at the same time, the following note on the spot :—" *Trifolium repens*. Common. A variety (?) occurs very generally with deep purple veins in the upper part of the petals, and then very beautiful. It requires further examination." There is a marked character in the veins of the leaves, which are prominent on the under side, those of *T. repens* being visible only by their darker colour by direct and transmitted light. The flowers become almost black when dried. As far as I recollect, the plant occurs in several places in the islands; and I have much pleasure in sending you fresh specimens in flower, hoping to communicate at a future time additional particulars, and leaving the whole question in your hands. Frederick Townsend.

[We shall publish a coloured plate of this highly interesting addition to our flora, as soon as the plants kindly transmitted to us, two of which are now growing in our garden, shall have produced ripe fruit. Professor Babington has kindly undertaken to determine the real name and the synonymy of this novelty. It is closely allied to *Trifolium repens*, and, as Mr. Townsend justly observes, a very lovely plant. In De Candolle's 'Prodromus,' ii. p. 199, a variety of *T. repens*, termed *rubescens* (floribus purpurascentibus, caulibus numerosis), and growing near Geneva, is mentioned; but we do not find it taken up by any subsequent author. This may be our new plant, judging from the brief description. But a diagnosis much more closely agreeing with it is found at p. 158 of Boreau's Flor. du Centr. de France, under the name of *T. glareosum*, Schleich. (*pallescens*, Sturm). The branches of that plant, however, are

said to be not rooting, whilst in ours they are both rooting and running, like *T. repens*. The flowers of *T. glareosum*, which Sturm, Koch, and most other authors describe as white or yellowish, are said to be *purple* by Boreau, as they are in our plant. Mr. Bentham, judging from a few scraps we sent to Kew, was inclined to regard Mr. Townsend's plant as *Trifolium hybridum*, Linn.; but that has fistulose and ascending stem and branches; the Scilly Islands plant, solid, running, and rooting ones.—Ed.]

NEW PUBLICATIONS.

Flora Australiensis: a Description of the Plants of the Australian Territory. By George Bentham, F.R.S., P.L.S., assisted by Ferdinand Mueller, M.D., F.R.S. & L.S. Vol. I.: *Ranunculaceæ* to *Anacardiaceæ*. Published under the authority of the several Governments of the Australian Colonies. London: Lovell Reeve and Co. 1863. 8vo, pp. 508.

This Flora, entirely in English, comprises the plants of the whole Australian continent and Tasmania, but it excludes those of New Zealand. It was at first proposed that the gigantic task of writing it should be shared equally between Mr. Bentham and Dr. Mueller, but on mature consideration it was found impracticable, four months having to elapse before an answer to any letters passing between the parties could be received. Dr. Mueller, though doing all in his power to forward the work by sending his herbarium, notes, and publications, has wisely left the final preparation of the Flora for the press to the practised hand of Mr. Bentham, who now presents us with the first instalment of the work, prefaced by a glossary of botanical terms. Mr. Bentham seems to have taken his own Hongkong Flora as his pattern. He gives us an analytical key to all the Orders, genera, and species, which will be found eminently useful in making out the name of a plant. There are, besides, full descriptions, and the principal references and synonyms, of each species. Though the whole letterpress has been arranged and printed in a very concise manner, the present volume, commencing with *Ranunculaceæ*, does not carry us further than *Anacardiaceæ*, and probably six or seven additional volumes will be required before the entire work is completed. There are no illustra-

tions, nor did it enter into the plan of the work to give an economic and popular account of the various species.

The materials from which this Flora has been drawn up are very rich; and Mr. Bentham informs us that collections were pouring in at a rapid rate when this first volume was going through the press, and promises, at a future time, additions and corrections; but these must be insignificant in comparison with what has been given. We should like to have seen mentioned the two important phenomena pointed out by Steetz, in *Tetratheca* and *Platytheca*, that in the former the flowers open only on bright days and close at night, whilst in the latter genus they are uninfluenced by clouds or the approach of evening. We also observe that he says:—"The figure of *Platytheca galioides*, Steetz, which Walpers quoted from the 'Paradisus Vindobonensis,' is not yet published." The whole first volume of the 'Paradisus,' including letterpress, was completed in 1860; and the figure in question, the only one ever published of that plant, is t. 73. We further miss the name of *Billardiera Hambruchiana*, a synonym of *Sollya linearis*.

We look forward to a second instalment of this valuable work, the execution of which could not have fallen into better and abler hands.

Kryptogamen-Flora von Sachsen, etc.—Cryptogamic Flora of Saxony, Upper Lusatia, Thuringia, and Northern Bohemia, with references to the adjacent countries. First Part, containing the *Algæ* in the widest sense, the *Liverworts*, and *Mosses*. By Dr. L. Rabenhorst. With more than 200 woodcuts, representing all the genera of Algæ. Leipzig. 1863. London: Williams and Norgate.

The district to which this handy little volume applies, is one whose boundaries are neither natural nor political. This is of little importance as regards the Algæ, for many of them are cosmopolitan, occurring wherever a suitable habitat in water or air, as the case may be, is presented; so that this volume may be considered as a handbook of the freshwater Algæ of Germany, and, n d eed, almost of Europe. It is different, however, with the Mosses, the distribution of which depends upon the latitude and altitude of the district. The highest localities are in the Erzgebirge, which in some places rise to a height of 4000 feet; yet they are not high enough to supply the conditions required by the alpine and subalpine species, and these are consequently

absent from this Flora. It is to be regretted that the illustrations of the genera, which so much enhance the first part of the volume, are not extended to the Mosses and Hepaticæ. Their want is the more to be wondered at as they are promised for the Lichens and Fungi. The value to the beginner of such accurate and inexpensive woodcuts as those of Dr. Rabenhorst's cannot be over-estimated. It has surprised us that they have not been more extensively used. The only work published in this country with such illustrations, as far as we know, is Mr. Gosse's work on marine zoology, in which, for a small sum, an accurate drawing of every genus of vertebrate and invertebrate animals inhabiting our seas is given. Why could not this be done more for botanists? We want a work on British Cryptogamia. It is thirty years since the fifth volume of the 'English Flora' appeared. In the interval there have been published monographs of the different Orders by Berkeley, Wilson, Smith, Harvey, Mudd, etc. These form a somewhat large and certainly an expensive library, beyond the reach of most botanists. A new edition of the now scarce Cryptogamic volume of the 'English Flora' would be a great boon to workers, for the interval of thirty years makes it to a considerable extent useless to its fortunate possessors. Great accessions to species have specially been made in the minuter organisms. Thus, the 2 species of *Desmideæ* have increased to 182, and the 54 *Diatomaceæ* to more than 700.

The eminent position Dr. Rabenhorst has attained as a careful and critical observer by his former works, as well as by his published fasciculi of plants, is strengthened by this useful Flora. We conclude by quoting from the preface some instructive sentences on the disappearance of habitats of Algæ and Charæ, plants the appearances of which depend upon manifold, but little-known influences. "We know, in general," he says, "that continued rain, and a higher level of the water in rivers, lakes, and morasses than usual, are as injurious as a great drought. In the years 1855, 1857, and especially 1858, many species were altogether wanting in localities where they were formerly well known. In 1858, the Charæ were everywhere sought for in vain. *Chara glomerata*, *C. polyacantha*, and *Nitella syncarpa* have disappeared within the last few years, and *N. mucronata* since 1855; it will be of great interest to observe the time and circumstances under which they reappear. In 1857, *Hydrodictyon* appeared in some places in such quantity that ponds and reservoirs were almost filled with it; since

then it has not shown itself in several of these places, while in others it occurs only in isolated patches. In the year 1862 it sprang up unexpectedly and abundantly in the tanks of the Botanic Gardens at Dresden, in which the *Victoria regia* is cultivated. Another phenomenon may be mentioned for the benefit of young algologists. At different seasons of the year different Algæ are found in one and the same locality. For instance, in May and June species of *Ulothrix* may be found on the floating timber of the Elbe; while in July and August *Cladophora glomerata* is common, and no trace of *Ulothrix* remains."

L'Ardenne. Par François Crepin. 8vo, pp. 68. Brussels: Gustave Mayolez. 1863.

The Belgians, amongst whom, a few years ago, local botany was but little cultivated, are now working hard at the study of their indigenous vegetation and its distribution. In 1859, M. Crepin, of Rochefort, who has since been chosen Professor at the State School of Horticulture at Ghent, published the first fascicle of his 'Critical Notes upon Belgian Plants,' and this has since been followed by two other fascicles, all three containing valuable observations upon critical species, and the report of experiments of cultivation which bear forcibly upon the question of how far some of the proposed species which have been obtained by the dismemberment of the old specific types are really distinct. In 1860 appeared the 'Manuel de la Flore Belgique' of the same author, an elementary handbook of the Belgian flora, with analyses of the genera and species, and short descriptions and notes of station. In 1861 were published a Flora of the province of Brabant, by Professor Van Heurck, of Antwerp, and M. Wesmael, of Vilvorde, and the first part of a Flora of the province of Antwerp, by MM. Van Heurck and Beucker, the first in French and the latter in Dutch. A Belgian Botanical Society has been formed within the last two years, to unite together the workers and systematize their labours, and under its auspices meetings are held and excursions organized. Professor Van Heurck published last year a fasciculus of dried specimens of fifty of the more interesting plants of the country, and these he proposes to continue annually. M. Crepin intends to issue, in the course of 1863, a 'Revue de la Flore Belgique,' with extended descriptions and geographical notes, to reach altogether about 450 pages. In 1862 he

published a pamphlet containing a physical description and Florula of the district round Han-sur-Lesse, a small, but botanically very rich, tract of low hilly country on the confines of Namur and Luxembourg; and now, in the pamphlet the title of which stands at the head of this notice, he asks us to traverse with him and note the plants of the more mountainous tract which occupies the south-eastern portion of the kingdom.

The district which he includes is bounded partly by natural and partly by conventional limits. The Ardennes are the chain of hills which form the termination, in a western direction, of the mountain barrier which bounds the great Germanic plain upon the south. On the east this barrier begins with the Carpathians, and it extends from east to west by way of the Sudetes, the Riesengebirge, the Erzgebirge, the Thüringer-wald, the Taunus, the Eifel, and then it enters Belgium. M. Crepin does not anywhere extend the limits of his district beyond the Belgian frontier in a south-eastern direction, and on the north-west he fixes his boundary at the line where the Silurian rocks of the hill-country cease, thus obtaining a tract which, so far as Belgium is concerned, has a well-marked physical character of its own, and is separated from the rest by well-marked physical peculiarities. It includes the greater part of the province of Luxembourg, and small portions of those of Liége, Namur, and Hainault. It is a tract of slate hills, amongst the beds of which various bands of arenaceous composition are intermixed, but entirely without limestone. Passing from the Ardennes towards the south-east, we have first New Red Sandstone and afterwards Lias and Oolite. Passing from it towards the north-west, we have Permian beds and Carboniferous limestones, but none of these are included. The highest peak attains an elevation of about 2200 English feet. It is a well-irrigated region, watered by branches of the Meuse and the Rhine. The principal tributary of the latter is called the Sure, which joins the Moselle at some distance from the hills. The Meuse flows from south to north, and its principal branches are the Semoy, the Lesse, the Homme, the Ourthe, and the Amblève.

"Ascending," he writes, "from the smiling valleys of the country between the Sambre and the Meuse, we are astonished, when we climb the elevated points of the Ardenne chain, at the entirely different aspect of the country, which is often strikingly desolate and severe in appearance. In the midst of those wide bare moors, with their sombre

covering of heather, where the soil, often turfy, is dotted with stagnant pools bounded by grasses and sedges with hard wiry leaves, and where animal life seems to have disappeared, the eye restlessly seeks afar the woods and the valleys which surround these deserts. Already at from 1500 to 2000 feet in our latitude we have an image, feeble it is true, of the upper region of the high mountains. The forests of Oak, and even of Beech, have almost disappeared; for at this elevation they have nearly reached their highest limit. In the patches of copse and wood which reach some of the less elevated plateaux, the trees, the Oaks especially, are usually stunted in growth and loaded with bearded lichens. As to the Coniferæ, they do not anywhere exist in a spontaneous state. The botanist, when he reaches these heights, sets to work to seek the few alpine species which are here and there to be met with, and in finding them, feels himself happy in gathering plants which seem to carry him to the midst of the high mountains. The illusion is increased by a temperature so low that in some of the mountain gorges the thermometer sinks below the freezing-point every night for three quarters of the year. Fogs are frequent, and the north-east wind is so keen that the inhabitants have to surround their houses with lines of Beech-trees. There is scarcely a more curious sight than some of these villages present, the houses swathed to their roofs in leafy greenery, the smoke of the chimneys alone revealing the existence of human habitations."

In a few pages of introduction our author sketches out what has been done in the botanical exploration of the Ardennes from the year 1806, when it belonged to France, and Lejeune was commissioned by the Prefect of the Department of the Ourthe to report respecting its botanical riches, up to the present time; and he tells us what portions have been well explored by himself and others, and where further research is needed. Then follows a brief physical description of the tract, its boundaries, its geology, its streams, and its scenery. For want of a sufficient number of species to characterize an upper climatic region he has not divided the district into zones of altitude. The species which he names as best adapted for this purpose are *Meum athamanticum*, *Juncus filiformis*, *Carex pauciflora*, *Lycopodium alpinum*, and *L. complanatum*. We suppose that these must be considered the most truly alpine plants which Belgium produces. Of the beauty of the slopes and valleys he speaks in glowing terms, but for his

account of the more picturesque places we must refer the reader to the book itself. Then follows a series of tables of the more conspicuous plants, arranged according to their places of growth, and a short but interesting account of the plants cultivated on a grand scale. The principal cereal crops are rye, oats, and barley, of which the former succeeds well up to 600 metres; wheat is of comparatively recent introduction; potatoes are grown largely, and are exported, and M. Crépin considers the district better adapted for grazing-farms and the growth of forage and root-plants than for corn cultivation. Of the indigenous woods the Oak and Beech form the groundwork; and in copses the Birch and Hornbeam are plentiful. The other frequent trees are *Acer Pseudo-platanus* and *platanoides*, the Ash, *Salix Caprea* and *aurita*, the Rowan, *Rhamnus Frangula*, *Euonymus Europæus*, and the Holly.

The subjacent rocks of the Ardennes are, as we have seen, entirely of the character which Thurmann calls eugeogenous. Comparing together the dysgeogenous Jura with the eugeogenous Vosges, Thurmann cites twenty-four species which he considers contribute the most conspicuously to the general vegetation of the Vosges, but which are rare amongst or absent from the Jura. In the Ardennes, M. Crepin says, ten of these species are abundant and widely diffused, ten species are less frequent, and four entirely absent. Of the six species which Thurmann gives as most abundant in the Vosges, as opposed to the Jura, five are common Ardennes plants. These are *Sarothamnus scoparius*, *Aira flexuosa*, *Jasione montana*, *Betula alba*, and *Luzula albida*.

The bulk of the pamphlet is taken up by a classified list of the flowering plants and ferns which the district produces. We are glad to see that pains have been taken to separate the species likely to be really indigenous. Excluding the former and using about the same standard of what are species as is employed in our London Catalogue, 663 plants are enumerated, out of which, in glancing through the list, we have counted only 44 species which have not a tolerably fair claim to be regarded as British. As might be expected, very few of these are species running out from Central Europe in a northern and western direction, which the rest of Belgium does not furnish. For the rarer species, the stations are given under their tracts of river drainage. Altogether the sketch is comprehensive in its plan, and seems very careful as regards matters of detail, and is well worthy of the attention of botanists.

BOTANICAL NEWS.

Mr. G. Mann has safely returned to England from Western Africa.

Dr. Mueller, Director of the Botanical and Zoological Gardens of Melbourne, is about to pay a visit to Europe. By last mail, he writes us that a new *Podocarpus*, allied to *P. spinulosa*, has been discovered in S.W. Australia, where no member of that genus had as yet been met with.

Mr. Charles D. B. Larbalestier intends publishing fasciculi of Channel Islands lichens.

From a letter addressed to Mr. Daniel Hanbury, we learn that Mr. Milne, whose departure for the West Coast of Africa we announced some months ago (p. 31), had safely reached his destination on the 12th of April, and was staying at Ikoneto, fifty miles up the Old Calabar river, busily engaged in collecting.

A motion made in the House of Commons for opening the Edinburgh Botanic Gardens on Sundays was negatived, on a division, by 123 to 107, the religious feeling in Scotland being opposed to the principle involved in the motion.

By the last mail from the Mauritius we received news of the sudden death of Ph. B. Ayres, Esq., M.D., of the Civil Hospital, Port Louis. Dr. Ayres was a pupil of Dr. Lindley, at the London University, and before leaving this country, about six years ago, paid a good deal of attention to our indigenous fungi, of which he published some fasciculi of dried specimens. He also commenced a detailed examination of the seeds of a large number of plants, for the purpose of ascertaining the relative abundance of starch in the seeds of different Natural Orders. In the Mauritius, he employed all his leisure time in investigating the flora of the island, and had formed an herbarium of native plants, as well as made drawings of a large number, for a 'Flora Mauritiana.' He likewise contributed papers to the Royal Society of Mauritius.

Died on the 8th of February, at Louvain, Belgium, Dr. Martin Martins, Professor of Botany there, and, in conjunction with Galeotti, author of a paper on Mexican ferns. He was born at Maestricht, in 1797.

Dr. Schleiden has resigned his chair in the University of Jena, and taken up his residence at Dresden.

Dr. Ascherson, of Berlin, one of the most painstaking of German local botanists, has gone to the island of Sardinia, to investigate its vegetation, and devote his special attention to the study of the *Isoëtes* species, a subject which, since so ably handled by Messrs. Gay, Braun, and Babington, is engaging more than ordinary attention.

A scientific association, to consist of 50 members, has been organized in the United States, under the title of "The National Academy of Sciences," Among the 50 we notice Professor Asa Gray and Dr. Engelmann.

From Perth, Swan River, we learn that Mr. James Drummond, one of the most zealous explorers of Western Australia, died at that place on the 27th of March, at an advanced age.

Tab. 8.

REVISION OF THE NATURAL ORDER BIGNONIACEÆ.

By Berthold Seemann, Ph.D., F.L.S.

(Plate VIII.)

Spathodea, *Beauv.*

In a paper read by me on the 16th of December, 1859, before the Linnean Society, the printing of which, owing to my sudden departure for the Viti Islands, was at my request deferred, I pointed out that the genus *Spathodea*, as presented to us in De Candolle's 'Prodromus,' included several widely different genera. Most of the climbing American species I referred to *Macfadyena* and *Dolichandra*, and restricted *Spathodea* to a few African and Asiatic species. Further examination, especially of Continental herbaria (Vienna, Berlin, Paris, etc.), and of authentic specimens to which the fruit is attached, has led me to reduce *Spathodea* still more.

Palisot Beauvois founded *Spathodea* upon two species, *S. campanulata* and *S. lævis;* but as their flower and fruit present differences of generic importance, the name *Spathodea* can be retained only by one of these two species, and as *S. campanulata* has always a spathaceous calyx (in *S. lævis* the calyx is subject to considerable variation), I retain the old generic name for that species, and give to *S. lævis* and its congeners the name *Newbouldia*, in honour of my esteemed friend, the Rev. W. W. Newbould, one of the most painstaking of British botanists. Both *Spathodea* as now restricted and *Newbouldia* are genuine *Catalpeæ*, and so are *Spathodea ? Dolichandra* (the type of the genus *Dolichandra*, Cham.), and *S. gigantea* and *glandulosa* (probably species of *Rademachera*).* *S. Rheedii*, *falcata*, *crispa*, *serrulata*, *heterophylla* (= Sp. *alternifolia*), are *Jacarandeæ*, for which I have adopted Fenzl's sectional name *Dolichandrone*. *S. stipulata* is likewise a *Jacarandea*, but generically distinct from *Dolichandrone*, and has been called by me in honour of my friend Mr. Clements R. Markham, who introduced the Chinchonas into India, *Markhamia*. The climbing *S. Candolleana* is evidently the type of a new genus, but at present I have not seen the fruit; and most of the other climbing species, as already stated, belong to *Macfadyena* and *Dolichandra*. Several other species referred to

* I have as yet not been able to get M. Bureau's paper on *Rademachera*, published in 'Adansonia,' and can therefore not speak positively on that point.

Spathodea by authors are members of older genera. *Macfadyena* belonging to *Eubignoniaceæ*, we had under *Spathodea* the following genera :—

I. EUBIGNONIACEÆ.

Macfadyena, De Cand. (type, *Spathodea uncinata*, Spr.). Amer. trop.

II. CATALPEÆ.

* *Pleiostictides.*

Dolichandra, Cham. (type, *Spathodea ? Dolichandra*, Steudl.). Amer. trop.

Spathodea, Pal. (type, *Spathodea campanulata*, Pal.). Afric. trop.

** *Monostictides.*

Newbouldia, Seem. (type, *Spathodea lævis*, Palisot). Afric. trop.

Rademachera, Zoll. (type, *Spathodea glandulosa*, Bl.). Asia trop.

III. JACARANDEÆ.

Dolichandrone, Fenzl, Seem. (type, *Bignonia spathacea*, Linn. fil.) Asia et Austr. trop.

Markhamia, Seem. (type, *Spathodea stipulata*, Wall.). Asia trop.

It is my intention to give illustrations of all these genera, to serve as landmarks in arranging the *Spathodeas*, and also to protect me from the charge of unnecessarily dismembering an old genus. I begin with—

MACFADYENA, *De Cand.*

The only species of this genus known to De Candolle in 1845 was *M. uncinata*, which has never been figured, and is a genuine *Eubignoniacea*, with a climbing habit and a spathaceous calyx. A second species was referred to it by Grisebach in 1858. It is the old *Spathodea corymbosa*, Vent., of which the fruit was unknown until Duchassaing sent it home from Panama attached to the plant. It is from Duchassaing's specimens, and a coloured drawing made by Duchassaing on the spot, both kindly lent to me by my friend Professor Grisebach, of Göttingen, that our Plate VIII. has been made. Unfortunately, the materials are not quite complete, for the capsules are far advanced, and have lost the septa, though the seeds have been preserved.

Mr. Miers, in a recent number of the Proceedings of the Royal Horticultural Society (May, 1863), has published an interesting Report on the plants collected by Mr. Weir, especially the *Bignoniaceæ*, where he

also touches upon the genus *Macfadyena*, of which he enumerates twenty-one species,* twenty on his own authority. He begs me to state that in doing so he had overlooked what Grisebach had written on *Macfadyena corymbosa* ('Bonplandia,' vol. vi. p. 10, and Fl. West Ind. p. 449), and what I had stated in my paper read before the Linnean Society about the greater number of climbing species of *Spathodea* being *Macfadyenas*. Until I shall have examined the fruit of the type of the genus (*M. uncinata*), I must hesitate to indorse the transferring of all the species of *Bignonia*, *Tabebuia*, and *Spathodea*, which Mr. Miers calls *Macfadyenas*. The calyx of *M. corymbosa*, *Coito*, etc., is very different from that of *M. uncinata* and its allies. It is cucullate at the apex, as well represented in our Plate; whilst in *M. uncinata* the apex is pointed. There is also a difference in the shape of the corolla between the two sets, accompanied by a marked difference in habit. In *M. corymbosa* and its allies the peduncles are compressed and minutely lepidote, whilst in *M. uncinata* they are round and without lepidote dots. It is therefore not improbable that we shall have to make a separate genus of *M. corymbosa*, *Coito*, *platypoda*, *laurifolia*, etc., and restrict the name of *Macfadyena* to *M. uncinata* and its allies.

Macfadyena *corymbosa* (Tab. VIII.); scandens, glabra, ramis teretibus; foliis trifoliolatis vel bifoliolatis cum cirrho intermedio; foliolis ovatis, subcordatis, acuminatis, integerrimis; petiolis pedunculisque basi biglandulosis, paniculis axillaribus dichotomis, ramis pedunculisque compressis minute lepidotis; calyce spathaceo, apice cucullato, minute lepidoto; corolla (flavo-rosea) tubuloso-infundibuliformi, obscure bilabiata, labio infero 3- supero 2-lobo, lobis obtusissimis, glabra; staminibus 4, didynamis, cum rudimento quinti, filamentis basi hirtellis; antheris divaricatis; ovario styloque glabro; stigmate bilamellato; capsula siliquæformi, compressa, valvis crassis lignosis extus asperiusculis cinereis (4–5″ long., 1–1¼ unc. lat.), filo marginali per dehiscentiam separato superstite, seminibus oblongis alatis (1½ unc. long., 6–8 lin. lat.) (v. s. sp.).

* Mr. Miers omits amongst these *Spathodea mollis*, Sonder, in Linnæa, xxii. p. 561; Walp. Ann. iii. p. 90 = *Macfadyena mollis*, Seem. ms., from Minas Geraes, Brazil (Regnell! in Herb. Sonder), a species closely allied to *Spathodea hispida*, De Cand. = *Macfadyena hispida*, Seem., but differing in having villose peduncles and a glabrous corolla, besides differently-shaped leaves.

Macfadyena corymbosa, *Griseb. in Bonplandia*, vol. vi. p. 10 (1858); *Ejusd. Fl. West Ind. Islands*, p. 449 (1860); *Miers in Proceedings of Hort. Soc.* vol. iii. p. 200 (1863).

Spathodea corymbosa, *Vent. Choix, t.* 40 (1803); *De Cand. Prod.* ix. p. 204 (1846).

Macfadyena lepidota, *Seem. ms.; Miers, l. c.*

GEOG. DIST. Island of Trinidad (*fide De Cand.*), West Indies (*Shakespear! in Mus. Brit.*), Isthmus of Panama (*Duchassaing! in Herb. Grisebach*).

EXPLANATION OF PLATE VIII.

Macfadyena corymbosa, from specimens collected in the Isthmus of Panama by Duchassaing, and a coloured drawing made by him on the spot, both in possession of Professor Grisebach. Fig. 1. Portion of corolla; 2. Stamen; 3. Pistil; 4. Ripe capsule; 5. Seed. Fig. 1, 2, and 3, slightly magnified; fig. 4 and 5, natural size.

HYPNUM EXANNULATUM, *Br. Sch.*, AND *H. ADUNCUM*, *L.*

BY W. CARRUTHERS, ESQ., F.L.S.

From the error I made in announcing the first of these plants as new to Britain, in the February number of the Journal (p. 55), I have been led to examine the two species. They are involved in considerable confusion.

Linnæus first described *H. aduncum* in his 'Flora Suecica' (No. 879), thus—"Hypnum caule erectiusculo subramoso, foliis secundis recurvatis subulatis, ramulis recurvatis;" he added the specific name in the 'Species Plantarum.' It is evident that this character includes several species. The authors of Bryol. Eur. notice that the Linnæan name quoted by Hedwig and subsequent writers belongs rather to *H. uncinatum*, *H. revolvens*, or some form of *H. fluitans*, than to *H. aduncum*, Hedw. And in confirmation of their suggestion, I find from examination that the specimen in the Linnæan Herbarium, named by Linnæus *H. aduncum*, is *H. uncinatum*, Hedw.

Linnæus quotes the 'Historia Muscorum' of Dillenius, but the description and figure in this work are insufficient to determine precisely what is meant. Dillenius however gives synonyms from the third edition of Ray's 'Synopsis,' which he edited. In the preface to Ray,

he acknowledges the liberality of Sir Hans Sloane in giving him the free use of the Hortus Siccus of the Rev. Adam Buddle. Buddle's plants may therefore be considered, at least when they are specially referred to, as typical for that edition of Ray. The species figured by Dillenius is "Hypnum palustre, erectum, sumitatibus aduncis, Syn. St. Brit. ed. 3, p. 82, n. 15;" and, "Muscus palustris, scorpioides, ramosus, erectus, Doody, Buddl. Hort. Sicc. vol. ii. fol. 22," is given as a synonym both in Ray and in his own 'Historia.' The specimen referred to in Buddle's Herbarium (now in the British Museum) is certainly *H. exannulatum*. In his manuscript Flora, Buddle says it was collected "on the boggs behind Charlton," and he adds the descriptive character "cum foliola cum sumitates huic reflexæ." It thus appears that *H. aduncum* of 'Flora Suecica' is *H. uncinatum*, Hedw.; and it is also certain that the British species first noticed by Ray (Syn. ed. 2, p. 38, n. 13), and more fully described by Dillenius (Syn. ed. 3, p. 82, n. 15, and Hist. Musc. p. 292, t. 37, f. 26), is *H. exannulatum*. Omitting the intermediate writers, we find that Wilson in his 'Bryologia Britannica' names and describes this plant as *H. aduncum*, L. His description when examined in the view of both species will be found as applicable to the one as the other; and his figure seems nearer *H. aduncum*, as now limited, than *H. exannulatum*. Schimper in his 'Synopsis Muscorum Europæorum' (1860), gives only five references to *H. aduncum* in other authors, because, as he says, of the great uncertainty regarding it, but one of the five which he quotes without any doubt is *H. aduncum* (L.), Wilson Bryol. Brit., and he does this notwithstanding the specimen, sent by Wilson with this name, had been determined by his associate Gümbel to be *H. exannulatum*. To Schimper then the figures and descriptions in Bryol. Brit. appeared to be *H. aduncum*, L.; but that Wilson could not have meant this species is evident from the fact that it was first noticed as a British plant in 1858, that is three years after the publication of the 'Bryologia.' When the authors of the 'Bryologia Europæa' distinguished the two species, it would probably have been better had they retained the Linnæan name for the exannulate plant; but as they have given careful diagnoses of both species, and a good name for that which they considered new, it would only create more confusion to alter the names. Mr. Berkeley in his recently published 'Handbook of British Mosses' gives *H. aduncum*, L., as the common species, quoting Wilson's description and plate, and *H. exan-*

nulatum as a new and rare species known only from Cheshire (*vide* p. 120). It is evident that both these are the same, and that he is unacquainted with the true *H. aduncum.*

The synonyms of the three species are then as follows:—

1. *H. uncinatum*, Hedw. Descr. et Adumbr. Musc. Frond. iv. p. 65, t. 25.—H. aduncum, *Linn. Sp. Pl. ed.* 1, *p.* 1126 (*fide Herb. Linn.*); *excl. Dill. Syn.* H. uncinatum, *Eng. Bot. t.* 1600; *Wils. Bryol. Brit. p.* 394.

2. *H. aduncum*, Hedw. nec Linn. non Wilson.

3. *H. exannulatum*, Br., Sch., and Gümb.; Muscus palustris, terrestri similis, etc., Ray, Syn. ed. 2, p. 38, n. 13; Muscus palustris scorpioides, ramosus, erectus, Doody, Buddl. Hort. Sicc. ii. fol. 22, n. 3. —Hypnum palustre, erectum, sumitatibus aduncis, *Dill. Ray, Syn. ed.* 3, *p.* 82, *n.* 15; *et Hist. Musc. p.* 292, *t.* 37, *f.* 26. H. aduncum, *Wils. nec Linn. non Hedw.* H. aduncum, *Berk.* H. exannulatum, *Berk.*

I am indebted to Messrs. Baker, M'Kinlay, and Davies for specimens of *H. exannulatum* from various localities. It is widely distributed all over the country, and is not very rare in fruit. *H. aduncum*, L., and Br. and Sch., has, as far as I know, only been noticed at Southport, Lancashire, from which place there are specimens in the Herbarium of the British Museum, collected by Mr. Wilson, June, 1858. A new species, *H. pellucidum*, Wils. ms., has been discovered by him at Wyburnbury Bog, Cheshire. This is *H. vernicosum*, Lindberg, and *H. aduncum*, var. δ *tenue*, Bryol. Eur., according to Berkeley; and *H. aduncum*, var. β *tenue*, Wils. Bryol. Brit., according to Mr. G. E. Hunt (in lit.).

I append a list of the British species belonging to that division of the genus to which Sullivant has given the name *Harpidium*, taking the description in Bryol. Eur. in accordance with Berkeley's determination as that of Wilson's *H. pellucidum*, with which I am yet unacquainted.

A. Dioicous.

a. ***Capsule with a ring.***

a. **Inner perichetial leaves with long deep furrows.**

* **Cauline leaves distant, subsecund, cordate-lanceolate** . . . . . . *H. Kneiffii*, Schimp.

** **Cauline leaves crowded, secund, ovate-acuminate** . . . . . . *H. lycopodioides*, Neck.

b. Inner perichetial leaves with scarcely any furrows.	
* Cauline leaves crowded, ovate-lanceolate	*H. aduncum*, Hedw.
** Cauline leaves less crowded on a slender stem, with broadly ovate base, narrowing into a slender lanceolate apex	*H. vernicosum*, Lindb. (*H. pellucidum*, Wils. ms.)
b. *Capsule without a ring*	*H. exannulatum*, Br. and Sch.
B. Monoicous.	
a. *Capsule with a ring.*	
a. Capsule cylindrical	*H. uncinatum*, Hedw.
b. Capsule ovoid	*H. revolvens*, Swartz.
b. *Capsule without a ring*	*H. fluitans*, L.

ADNOTATIONES IN CASSINIACEAS WRIGHTIANAS CUBENSES, A CL. GRISEBACH DETERMINATAS.*

Auctore C. H. Schultz-Bipontino.

Die 20° m. Nov. 1861, ab amicis. Asa Gray, Cassiniaceas a cl. Wright an. 1860 in Cuba orientali lectas, accepi. Cum præter collectiones Cubenses notas etiam die 6° m. Jan. 1849 collectiones an. 1844 pr. Santiago de Cuba a cel. Linden factas, in herbario habeam, Cassiniaceæ Wrightianæ valdopere me delectaverunt, cum plurimas species Lindenianas, nondam publici juris factas, aliasque penitus novas inter eas observaverim. Hisce diebus mihi amic. Grisebach commentationes de plantis Wrightianis Cubensibus transmisit. En summa observationum mearum cum iis cel. Grisebach comparata.

N. 1305, sub *Vernonia menthæfolia* duæ latent species, nempe:

Vernonia menthæfolia, Less.!; De Cand. Prod. v. 38, n. 131, ex parte; *Eupatorium menthæfolium*, Pœpp.!; Sprgl.! Syst. Veg. iii. 412; De Cand. Prod. v. 183, n. 280, cui sec. specimen Pœppigii, in frutcetis Cubæ m. Januario lectam, folia elliptica, subserrata, capitula numerosa, parva, 11-flora, involucrum 1 lineâ vix altius. Ramosissima, rami cymosi in paniculam pedalem disposita, et:

Vernonia Grisebachii, Sz. Bip., n. sp., cui sec. specimen Wright. n.

* Plantæ Wrightianæ e Cuba orientali a Grisebach (ex Mem. Acad. Americ. Scient. et Artium, n. ser. tom. viii.). Cantabrigiæ Nov. Angl. Pars I., Dec. 1860. Pars II., Nov. 1862.

1305 (fruticosa, scandens, floribus albis), folia oblongo-lanceolata, integerrima, capitula pauciora, duplo majora, 20-flora, involucrum ultra 2 lin. altum. Cyma terminalis, diametro spithameo,= Vernonia menthæfolia, *Griseb. Pl. Wright.* p. 510, et verisimiliter De Cand. l. c. ex parte.

Obs. *Vernoniam Havanensem*, De Cand. Prod. v. p. 37, n. 137, quam a cl. Don Ramon de la Paz habeo, etiam in ins. Cuba pr. la Havana, Jan. 1838, leg. cl. Linden! n. 45, sed flores observavit albos.

N. 285, a cl. Grisebach pro *Vernonia rubricauli*, H. B. K.; De Cand. Prod. v. p. 46; foliis latioribus determinata, species est nova, distinctissima. Amic. Grisebach ipse l. c. dicit: "specimina nec icone nec descriptione Bonplandii congrua."

Veram *Vernoniam rubricaulem*, H. B. K., stirpem elegantissimam, mere Columbicam, in herbario habeo:

(1) Hartweg! n. 1087; Benth.! Pl. Hartweg. p. 197. In herbosis inter Rio Negro et pagos Fusagasuga et Pandi, prov. Bogotá.

(2) Nov. Granada, prov. Bogotá, in Savanis pr. d'Icononza, alt. 3000′, Dec. 1842; Linden! n. 825 (♄ flor. violac.).

(3) Venezuela, prov. Merida, alt. 7000′, in Savanis Sier. Nevada, Jul. 1842; Linden! n. 330 (flor. purpurei).

(4) In herb. reg. Ber. v. a cl. Moritz! n. 1427, lectam in prov. Merida, in graminosis planitiei (Mesa) rarius, Nov. (flores rosei).

Stirps nostra vocanda:

Vernonia inæquiserrata, Sz. Bip., n. sp.; caule (herbaceo?) tereti, leviter cinereo-tomentoso, simplici, apice corymboso-paniculato, conferte foliato; foliis oblongo-lanceolatis, utrinque attenuatis, cum petiolo 2 lin. longo 3–3½ poll. longis, 8–9 lin. latis, *inæquiserratis*, supra glabrescentibus, infra cinereo-tomentosis; capitulis secus ramos ad axillas sessilibus, solitariis, unilateralibus, folio fulcranti multo brevioribus, 15-floris; involucri cinereo-pubescentis ovato-campanulati squamis imbricatis, ovato-oblongis, obtusis, brevissime mucronatis; achæniis glabris; pappi biserialis albi serie externa brevi lineari; floribus albis.

Planta cinerascens, hab. in præruptis Cubæ orient., Wright! n. 285.

Obs. Species nova, etiam sicuti *Vernonia inæquiserrata* ad *Vernoniæ* sect. viii. *Lepidaploam* § 4 spectans, est

Vernonia Sprengeliana, Sz. Bip.,= Eupatorium salicinum, *Sprgl.! Syst. Veg.* iii. *p.* 412, *n.* 30, sec. specimen herbarii C. Sprngel. a C. Bertero! (*Eupatorium salvifolium*, Bert.!) lectum. Species nostra *Ver-*

noniæ acuminatæ, Less.; De Cand. Prod. v. p. 47, n. 186, affinis esse videtur. Folia vero non sunt opposita uti Sprgl. in diagnosi asserit, sed revera alterna.

Diagnosis: Fruticulosa; ramis brevibus, rectis, sordide pubescentibus, in corymbum confertum 4½ poll. diametro metientem dispositis; foliis 3 poll. longis, 8 lin. latis, lanceolatis, vix petiolatis, acuminatis, inferne attenuatis, sed basi ipsa fere truncatis, integris, supra scabris subrugosis, infra cinereo-tomentosis rugosis; ramis brevibus, rectis, numerosissimis, pauci- ad summum 2–5-cephalis; capitulis brevissime pedunculatis, unilateralibus, approximatis, folium fulcrans subæquantibus, 14-floris; involucri turbinato-campanulati, 4–5 lin. alti, 6–7-serialiter imbricati, inferne pubescentis, foliolis subciliatis dilute brunneis, inferioribus minimis triangulari-ovatis confertis, superioribus oblongo-linearibus, obtusis, omnibus acumine brevissimo apiculatis; floribus glabris, pulcherrime roseis; achænio glabro, elongato, superne annulo prominente instructo; pappi biserialis sordidi serie externa brevi, lata.

Species, sicuti antecedens distinctissima, nulli aliæ comparanda.

Hab. S. Domingo, *Bertero, n.* 507.

N. 284, a cl. Grisebach, l. c. p. 511, pro *Vernonia rigida*, Swartz, var. (V. Sagræana, *De Cand.*) determinata, toto cœlo a planta differt genuina. *Vernonia rigida*, Swartz!, cujus specimen auctoris in herbario Schreberiano vidi, planta rigidissima, ab omnibus differt ramis flexuosis, involucro turbinato, imbricatissimo, ½ poll. longo, cum pedunculo brevi pariter squamis obsito obtusis. Nostra species nova est, elegantissima,=

Vernonia leptoclada, Sz. Bip.; suffruticulosa; ramis gracilibus, teretibus, cinereo-tomentosis, demum glabratis; foliis cum petiolo 1 lin. longo 1½ poll. longis, ½ poll. latis, basi apiceque obtusiusculis, oblongis, supra glabris rugosissimis, infra cinereo-tomentoso-villosis, integris, subrevolutis, cymis scorpioideis, unilateralibus, rectis; capitulis sessilibus, folio multo brevioribus; involucri campanulati 2 lin. alti pubescentis foliolis ovato-lanceolatis, breve spinoso-acuminatis; floribus glabris; achæniis villosis; pappo externo brevi lato albo, interno sordido piloso, denticulato.

Hab. in Cuba orientali, *Wright! n.* 284, et cum Vernoniis in *De Cand. Prod. p.* 48 et 49, enumeratis præcipue cum speciebus n. 191–193 comparanda, ergo ut sequens ad § 5 spectat.

N. 1309, a cl. Grisebach, p. 511, pro *Vernoniæ arborescentis*, Sw.,

varietate salutata, sec. specimen herbarii Schreberiani (Serratula . . . verisimiliter a Swartzio ipso com.) et Berterii e Guadalupa, cf. De Cand.! Prod. v. p. 48, n. 191, β, non huc spectat, sed potius cum *Vernonia Schiedeana*, Less.!, De Cand.! Prod. v. p. 47, n. 182, cujus habitum penitus refert, comparanda etiam nova est species:

Vernonia Wrightii, Sz. Bip.; fruticosa; ramis teretibus, pubescenti-brunneis; foliis cum petiolo ½–1 lin. longo oblongo-ellipticis, coriaceis, utrinque attenuatis, basi truncatis, 3 poll. longis, 13–14 lin. latis, integris sed margine cum folii apice breve apiculatis, penninerviis; nervis sub angulo recto adscendentibus, glabris, exceptis costa et petiolo; cyma scorpioidea, divergente; capitulis sessilibus, 26-floris, folio fulcranti duplo brevioribus; involucri campanulati pubescentis foliolis imbricatis, externis ovato-oblongis spina recurva, internis oblongo-lanceotis spina recta brevissima terminatis; corolla glabra; achænio glabro, ⅘ lin. longo; pappi biserialis serie externa brevi alba, interna 2¾ lin. longa, sordide subviolacea.

Hab. in Cuba or., *Wright, n.* 1309.

Obs. *Vernonia Schiedeana*, Less.; De Cand. Prod. v. p. 46, habitu proxima, achænia habet sericeo-villosa et involucri foliola erecta, intima apice obtusa scariosa. Hab. Mexico, *Linden!*, *Sartorius!*, *Schaffner!*, *Müller!*, *Ehrenberg!*

N. 287, *Eupatorium Plucheioides*, Griseb.! p. 511, certe species est nova. Formam habeo latifoliam; foliis ovatis, cum petiolo 2 lin. longo 3½ poll. longis, fere 2 poll. latis; a cl. Linden! n. 2086, in sylvis de Nimanima prov. Cubensis Santiago, alt. 3500′, Aug. 1844, lectam (♄ flor. albis), forsan separandam, = Eupatorium tricephalotes, *Sz. Bip. in litt. ad cl. Linden!, an.* 1849.

N. 1307 et 1308, *Eupatorium lantanifolium*, Griseb.! p. 511, duas formas, an species, comprehendit:

a. N. 1307, *ferruginascens*, foliis ovatis, subtus ferrugineo-tomentosis.

b. N. 1308, *cinerascens*, foliis subrotundis, infra cinereis.

Obs. *Eupatorio lantanifolio* affinis est nova species a cl. Linden! n. 1966, in mont. Libano prov. Cubensis Santiago alt. 4500′ m. Junio 1844 lecta (♄ flor. albis), =

Eupatorium libanoticum, Sz. Bip. in litt. ad cl. Linden, an. 1849; fruticosum; caulibus teretibus, brunneo- (an ætate) tomentosis; foliis oppositis, cum petiolo brevi vix ultra 1 lin. longo ultra 2 poll. longis,

ultra 1 poll. latis, ovatis, basi rotundatis, apice obtusis, integris, supra rugosis glabris, infra tripli-penninerviis, rugoso-lacunosis, cinereo-brunneis, pubescenti-glandulosis, reflexis, caulique adpressis; ramis brevibus, horizontaliter patentibus, apice conferte corymbosis, in paniculam dispositis perfoliatam 3 poll. longam 2 poll. infra latam; capitulis subsessilibus, 55-floris; involucri ovati, 3 lin. fere longi, imbricati squamis triangulari-lanceolato-linearibus, acutiusculis, sericeis; floribus albis, glanduliferis; achæniis parce glanduloso-pilosis, pappi sordidi 1-serialis radiis apice paulo incrassatis.

Valde affine speciebus 3 novis ab am. Grisebach propositis, præcipue vero *E. lantanifolio* et *hypoleuco*, a quibus præter notas indicatas differt præcipue foliis infra pubescenti-glandulosis.

N. 1629, *Eupatorium hypoleucum*, Griseb.! l. c., n. sp. *Eupatorio lantanifolio*, b. *cinerascenti*, valde accedit.

N. 291, recte a cl. Griseb. p. 511, pro *Adenostemmate Swartzii*, Cass.; De Cand. Prod. v. p. 110, n. 1, determinatur = Adenostemma Verbesina, *Sz. Bip. ms.*, = Cotula Verbesina, *Linn. Am. Acad. p.* 407, = Lavenia decumbens, *Swartz! Fl. Ind. Occ. n.* 1311.

N. 292, a cl. Griseb. l. c., pro *Adenostemmate triangulari*, De Cand. Prod. v. p. 113, n. 19, habitum, = Adenostemma Berterii, *De Cand.! Prod.* v. *p.* 110, *n.* 2, sec. specimen C. Berterii (Lavenia decumbens e S. Domingo).

A. triangulare, De Cand., inter alia caule petiolisque substrigosis differt sec. specimina a cl. Gardner! n. 503 et C. Riedel! n. 221, lecta.

N. 303, *Mikania Swartziana*, Griseb.! Fl. Ind. Occ. l.c., = Eupatorium Houstonis, *Swartz* (ubi?), *non Linn.* (spec. Mexic.) pariter a cl. Linden! n. 2141 (♄ scandens, flor. albis), Brazo de Canto, prov. de Santiago Cubæ, alt. 3000′, Sept. 1844 lecta, mihi etiam speciei erat pignus distinctæ.

N. 300, *Mikania gonoclada*, Griseb.! (non De Cand.) l.c. p. 512, = M. Pœppigii, *Sprgl.; De Cand. Prod.* v. *p.* 200, *n.* 97, sec. specimen auctoris.

N. 299, *Mikania corydalifolia*, Griseb.! p. 512, species nova est elegans.

N. 312, *Microcœciam repentem*, Hook. f. Fl. Galap.; Griseb. l. c. p. 513, in herbario cum *Pinillosia* (strigosa) *repente*, Sz. Bip., junxi.

N. 1317, *Ancistrophora Wrightii*, A. Gray!; Griseb.! l. c. p. 514,

sec. cl. auctorem melius a Sz. Bip. in Bonplandia, 1861, p. 365, ad *Hamulium* allata.

N. 327, *Senecio trineurus*, Griseb. l.c. p. 514, mihi etiam sec. specimen a cl. Linden! m. Oct. 1844, in littorali prov. Cubensis Santiago lectum (fruticulus scandens, flor. flavis), nova erat species.

N. 328, *Senecio plumbeus*, Griseb. l. c. p. 515, nova species est insignis.

N. 329, *Senecio polyphlebius*, Griseb. l. c. Non vidi. Affinis esse videtur:

Senecio gamolepoides, Sz. Bip., n. sp.; glaber; foliis ovatis, penninerviis, dentatis, cum petiolo 5 lin. longo 3½ poll. fere longis, 1½ poll. latis, corymbo conferto, terminali; involucri cylindracei 3 lin. alti squamis 3 concretis et 1 libera; capituli 5-flori floribus flavis, 2 radiatis fœm., 3 tubulosis hermaphroditis; achæniis glabris. Patria: Surinam, Weigelt!, cum *Senecione Swartzii*, De Cand. Prod. vi. p. 411, n. 412 (*Cineraria glabrata*, Sw.; Sprgl.! Syst. Veg. iii. 546, n. 15), in Herb. Sprengel! mixtus.

N. 289, *Liabum Brownei*, Griseb. Pl. Wright. Cub. p. 515, in herbario vocavi:

Liabum (*Amellus* Linn., Sw., Sprgl.!) *umbellatum*, Sz. Bip.; foliis supra arachnoideis, demum glabris, infra niveo-tomentosis sec. specimen in ins. S. Domingo a cl. Bertero! n. 707, lectum (*Starkea umbellata*, Willd.; *Amellus umbellatus*, Sprgl.! Syst. Veg. iii. 575, n. 2) et Swartzianum ex mont. sum. Jamaicæ in Herb. Monac. Specimen Berterianum, et ni fallor etiam Swartzianum, caulem habent subaphyllum, nostrum vero Wrightianum caulem altum foliis oppositis magnis instructum, cum petiolo, crispo-alato, 1 poll. longo, connato, 3½ poll. longis, ovato-subcordatis, 2 poll. fere longis, = Liabum crispum, *Sz. Bip., n. sp.*

N. 288, *Liabum Wrightii*, Griseb. p. 515, etiam m. Aug. 1844, in Pinal de Nimanima prov. Cubensis Santiago, a cl. Linden! n. 2093 (flor. flavi) lectum; mihi etiam bona species foliis supra hirtis ab affinibus jam distincta.

Obs. Speciem huic affinem habeo, pariter ab am. Linden! n. 2031, in ins. Cubæ prov. Santiago in "grosse roche sum. Sierra Maestre," alt. 5000′, Jul. 1844 lectam, =

Liabum Cubense, Sz. Bip. in litt. ad cl. Linden, an. 1850; herba ♃, caule dodranthali-pedali, inferne albo, superne brunneo-violaceo-tomen-

toso, subaphyllo, apice corymboso, pedicellis aphyllis capitula radiata subæquantibus; foliis plerisque radicalibus, 7 poll. longis; lamina folii 3–4 poll. longa, 1–1¾ poll. lata, oblongo-ovata, obtusiuscula, inæqualiter dentata, subhastata, basi sensim in petiolum cuneatum subæquilongum attenuata, supra conferte hirto-scabra, infra albo-tomentosa; involucro imbricato inferne tomentoso v. glabrescente; floribus aureis radii multiserialibus, fœmineis, disci tubulosis hermaphroditis; achæniis columnaribus, hirtis; pappo 1-seriali, piloso, sordido.

Liabum Cubense, meum, cum descriptione *Liabi Brownei*, Cass. Dict. Sc. Nat. xxvi. p. 203, 204, convenire videtur. Cum vero planta Brownei cum *Liabo umbellato*, Sz. Bip., sit identica, *Liabum Brownei*, Cass., synonymis *Liabi Cubensis* subscribenda.

Analysis *Liabi* subgeneris *Starkeæ*, Willd. Sp. Pl. iii. p. 2216; De Cand. Prod. v. p. 96, § 1 (achænia cylindracea, pappus 1-serialis; capitula plurima, corymbosa):

A. Folia supra araneosa, glabra.

a. Petioli nudi exauriculati, caulis tomentosus.

Liabum umbellatum, Sz. Bip.

Liabum crispum, Sz. Bip.

b. Petioli stipulaceo-auriculati, caulis glabriusculus.

Liabum (Conyza, *Vahl*) *stipulatum*, Sz. Bip.—Syn. *Liabum Jussieuii*, Cass.; De Cand. Prod. v. 97.

B. Folia supra pilis articulatis hirto-scabra.

a. Folia spathulato-lanceolata, supra sparsim hirta.

Liabum Wrightii, Griseb.

b. Folia ovato-oblonga, subhastata, supra conferte hirta; involucrum inferne tomentosum.

Liabum Cubense, Sz. Bip. (an L. Brownei, *Cass.?*)

N. 332, *Leria media*, Griseb.! l. c. p. 515; species pulcherrima est, affinis *Leriæ albicanti*, De Cand. Prod. vii. 42, quam possideo a cl. Bertero lectam e Jamaica, n. 2743 et S. Domingo, n. 647.

N. 333, *Leria pumila*, De Cand. Prod. vii. p. 42; Griseb. l. c.; eandem habeo m. Majo 1844 in rupibus calcareis mont. Libani, prov. Cubensis Santiago, alt. 4500′, a cl. Linden! n. 1848 bis (flor. albi) lectam, et formam *integrifoliam*, Sz. Bip. m. Aug. 1844; in pinetis (Pinal) m. Nimanima, alt. 2500′, Linden!

TRICHOMANES RADICANS INDIGENOUS TO YORKSHIRE AND WALES.

By Thomas Moore, Esq., F.L.S.

"This beautiful capillary," says Dr. Richardson, on the label attached to a specimen of *Trichomanes radicans*, "I lately found in the moist and shady rocks nigh Bingley." The specimen is preserved amongst Uvedale's plants in Sloane's Herbarium, vol. cccii. p. 66, at the British Museum. On the faith of a specimen collected by Dr. Richardson "at Belbank, scarce half a mile from Bingley, at the head of a remarkable spring," the plant was admitted by Dillenius into the third edition of Ray's 'Synopsis' (1724). In later times it has only held a place in the flora of the United Kingdom, in virtue of its occurrence in Ireland, but it may again establish its claim to rank as a genuine English plant, as was stated in the 'Gardeners' Chronicle' (1863, p. 602). Some time ago I received a specimen from Mr. Walter Crouch, a gardener, who had gathered it in one of the fells in the Rydal district of Westmoreland. The habitat was described as being on wet rocks, and the plant was stated to occupy a space of about a square yard, not all in one mass but scattered. Of the identity of the plant, and the fact of its discovery, there is no doubt; but I have been informed by some Westmoreland pteridological friends, that there exists a suspicion of its having been planted some ten years before. Even if this should be so, it is an interesting fact, that it has survived and so far established itself as to pass unscathed through some of our more severe winters.

I learn further, from Mr. J. F. Rowbotham, of Manchester, that he has more recently found *Trichomanes radicans* in North Wales, in a part of the Snowdon range. The precise locality it would be imprudent to indicate, lest the information should lead to the eradication of the plant. The fronds were, as I learn, abundant, and remarkably fine; one of them, with which Mr. Rowbotham has kindly favoured me, is quite equal to the bulk of the Irish specimens in luxuriance of development, the frond having the broad or triangular-ovate outline of the more perfect examples of this Fern, and measuring about seven inches across the widest part, and nearly ten inches in length, in addition to a stipes of eight inches long. This specimen is not fertile.

Another frond in Mr. Rowbotham's possession is rather larger, having a total length of about twenty-two inches. Mr. Rowbotham describes the habitat as agreeing in all its circumstances with those referred to in my Fern-books, and the plant as only varying from the figure in the octavo 'Nature-Printed British Ferns,' in being of larger growth. "I found it," he writes, "in a large hole formed by fallen rocks alongside a cascade of water; and admission to this hole, which is about five feet high by four feet wide, is obstructed after a depth of about three feet by this Fern falling from the rocks at the top, and growing out of the sides in the form of a beautiful curtain, down which the water is constantly trickling; the whole having much the appearance of a crystal screen." What a treat to a Fern-seeker, to stumble on such a sight as this! So unwilling was the finder to disturb the singular and beautiful effect, that he took with him only an offshoot or two from the principal network of rhizomes, "out of which the innumerable fronds were projected." To so much, as the discoverer, he was fairly entitled, but it will be a sacrilegious hand that does aught beyond this, to destroy so unexpected a habitat for so rare a plant.

Mr. John Field mentions in the 'Gardeners' Chronicle' of July 11th, a rumour that Williams, the late guide, had planted in the Snowdon district Irish specimens of the *Trichomanes*, but even if so, this would hardly account for the luxuriant and well-established condition in which Mr. Rowbotham found it.

THE ORDEAL BEAN OF CALABAR (*PHYSOSTIGMA VENENOSUM*, *Balf.*), AND THE BEST METHODS OF APPLYING IT IN OPHTHALMIC MEDICINE.

BY DANIEL HANBURY, ESQ., F.L.S.

The recent experiments of Drs. Argyll Robertson, Fraser, and Stewart, and of Messrs. Bowman, Wells, and others on the Ordeal Bean of Calabar* and the fact elicited by these experiments that it possesses the peculiar power of causing the sphincter pupillæ and ciliary muscle to contract, render it probable that this remarkable seed will find a

* Edinburgh Medical Journ. March 1863; 'Medical Times and Gazette,' 16 May, 1863; also Seemann's 'Journal of Botany,' i. p. 127.

useful application in ophthalmic medicine; and the present moment is therefore appropriate for reviewing some of the facts hitherto ascertained respecting it.

The first important notice on the subject is contained in a most interesting and valuable paper by Dr. Christison read before the Royal Society of Edinburgh, 5 February, 1855. In this paper the author after alluding to various vegetable substances used by the natives of tropical Western Africa in ordeal by poison, describes as one of pre-eminent virulence, a large leguminous seed called *Eséré*, used by the negroes of Old Calabar in the Gulf of Guinea. This seed, which Dr. Christison called the *Ordeal Bean of Old Calabar*, and the botanical origin of which was at that time unknown, was the subject of some remarkable toxicological experiments which amply proved it to possess powers of no ordinary character. Dr. Christison also made some experiments on the seed with the view of isolating its active proximate principle, but was unsuccessful, partly owing, it is probable, to the limited amount of material at his disposal. "All I can say," he observes, "is that the seed, like others of its Natural Order, contains much inert starch and legumin, and 1·3 per cent of fixed oil, also probably inert; that its active properties may be concentrated in an alcoholic extract, which constitutes 2·7 per cent. of the seed; and that this extract does not yield a vegetable alkaloid by the more simple of the ordinary methods of analysis."*

Some of the Ordeal Beans in Dr. Christison's possession having been placed in earth, germinated in the Botanic Garden of Edinburgh, and in the garden of Professor Syme, producing vigorous plants; but as these did not flower, no determination of the genus to which the plant belonged could be made. At length, about the year 1859, the Rev. W. C. Thompson of Old Calabar, a good botanical observer, was so fortunate as to obtain, after many trials, complete and excellent specimens of the plant, some of which, preserved in fluid, were communicated to Mr. Andrew Murray and Professor Balfour. Their examination devolved chiefly on the latter gentleman, who on the 16 January, 1860, read before the Royal Society of Edinburgh a *Description of the Plant which produces the Ordeal Bean of Calabar*, which, illustrated by two plates, was subsequently published in the Society's *Transactions*.†

The Ordeal Bean belongs to the Natural Order *Leguminosæ*, the

* Pharm. Journ. vol. xiv. (1855), p. 472. † Ib. vol. xxii. p. 305.

suborder *Papilionaceæ* and tribe *Phaseoleæ;* but subordinate to this, its characters have been considered sufficiently peculiar to warrant the formation of a special genus for its reception. This has accordingly been done, the new genus receiving from Dr. Balfour the name of *Physostigma*,* and the one species which it contains, that of *venenosum*.

The most remarkable character of the genus *Physostigma* is that derived from the stigma, which possesses a singular, crescent-shaped, hooded appendage. By this character and the long grooved hilum of the seed, it is separated from the nearly allied genus *Phaseolus;* and from *Mucuna*, to which its seed bears considerable resemblance, by the characters of its flowers and pod; from *Canavalia* by its diadelphous stamens and other characters; and from *Lablab*, by its phaseoloid carina and its pistil.

Physostigma venenosum, the Ordeal Bean, is a large climbing perennial with a woody stem of two inches diameter and sometimes fifty feet in length. Its large leaves are pinnately trifoliolate, with ovate acuminate leaflets. Its papilionaceous flowers are in pendulous racemes, the stalk or rachis of which is covered with tuber-like knots; each flower is about an inch in length and of a pale-pink or purplish colour, beautifully veined. The legume when full-grown is about 7 inches in length, elliptico-oblong with a short curved point, stipitate, dehiscent and containing two or three seeds. The seeds, which are oblong or somewhat reniform, are from 1 to 1$\frac{3}{8}$ inches in length by about $\frac{3}{4}$ of an inch in breadth; their convex edge marked by a long sulcate hilum, extending as a deep furrow from one extremity of the seed to beyond the other. The exterior of the seed is somewhat rough, with a dull polish; its colour is a deep chocolate-brown, somewhat lighter on the raised edges of the furrow. The seeds weigh, on an average of twenty, 67 grains.

The Ordeal Bean is difficult to obtain even near the localities where

* From φυσάειν *to inflate*, and στίγμα. The genus is thus defined:—Calyx campanulatus, apice quadrifidus, laciniis brevibus, lacinia suprema bifida. Corolla crescentiformis, papilionacea; vexillum recurvum, apice bilobatum, basi angustatum, margine utroque auriculatum, membranâ inflexâ auctum, medio longitudinaliter bi-callosum; alæ obovato-oblongæ, liberæ, supra carinam conniventes, versus basin appendiculatæ. Discus vaginifer. Ovarium stipitatum, 2–3-ovulatum. Stylus cum carina tortus, infra stigma subtus barbatus; stigma obtusum, cucullo cavo oblique tectum. Legumen dehiscens, oligospermum, elliptico-oblongum, subcompressum, extus rugosum, endocarpium intus telâ laxâ cellulari tectum, isthmis cellulosis inter semina. Semina strophiolata, hemisphærico-oblonga, hilo late sulcato semicincta.—Herba suffruticosa, volubilis, in Africa occidentali tropica crescens: foliis pinnatim trifoliolatis, stipellatis, floribus nodoso-racemosis, purpureis.

it is produced. Dr. Christison states upon the authority of the Rev. H. M. Waddell of Old Calabar, that "the plant is everywhere destroyed by order of the King, except when it is preserved for supplying the wants of justice,—and that the only store of seeds is in the King's custody." Whether this remains to be the fact, I know not; but Mr. Gustav Mann, Collector to the Royal Gardens, Kew, to whom I wrote some time ago requesting a supply of the beans, remarked in a letter under date November 24, 1861, that he had been able to procure but few, "as the people do not like to give them to Europeans. There is no reason, however, to suppose that this reluctance will continue if a good money-value become attached to them."

Some difficulties have occurred in devising a preparation of the Calabar Bean which should be conveniently applicable to the eye. These difficulties have arisen from the fact that the alcoholic extract which contains the whole of the poisonous principle of the bean can only be imperfectly dissolved in water, and that its alcoholic solution is inadmissible. There is also another difficulty which occurs with all liquids that are required to be dropped into the eye, and that is, that the flow of tears which instantly follows such an application greatly reduces the amount placed in contact with the membrane,—or at any rate renders it very uncertain.

These considerations have suggested other expedients for applying the remedy, one of which is to use the extract by itself; another is to employ it diffused through paper, after the manner recommended by Mr. J. F. Streatfeild for the application of atropine;* and a third is to use a solution of the extract in glycerine. Each of these methods has certain advantages. The extract, which is prepared by exhausting the finely powdered bean with alcohol sp. gr. ·838 and evaporating the solution, is not a homogeneous body, but contains a small amount of greenish fatty oil which separates as the solution is concentrated. Its action upon the eye is rapid and powerful. The best means of using it is to moisten a camel's hair pencil with water and then with its tip to rub off a minute quantity of extract and apply it to the palpebral conjunctiva of the lower lid:—so applied, its specific action ensues in the course of a few minutes. This method of the direct application of the extract would probably be hardly advisable in any other than professional hands.

* Ophthalmic Hospital Report, Jan. 1862, p. 310; also Pharm. Journ., Jan. 1863, p. 329.

The method of applying *atropine* to the eye by soaking a piece of thin bibulous paper of definite size in a known quantity of solution of atropine and then allowing it to dry, has been recommended in this country by Mr. Streatfeild and in France by Mr. Leperdriel.* Such paper should be cut into small pieces from $\frac{1}{5}$ to $\frac{1}{8}$ of an inch square, the proportion of atropine being so regulated that a single square shall represent a drop of the ordinary solution of two grains to the ounce. Paper prepared on this principle with a solution of Calabar Bean answers extremely well, and promises to afford the most definite method of regulating the quantity of the remedy to be applied. The following is the process which I have adopted. One ounce Troy of the bean, reduced to fine powder, is to be thoroughly exhausted by hot rectified spirit (·838); the solution so obtained is to be filtered and evaporated until extract begins to deposit on the bottom of the dish, which will occur when the solution has been reduced to about ten fluid drachms. When cold this solution is to be passed through a small filter, and is then ready for the paper. This may be thin writing-paper, the size contained in which has been removed by boiling;† it should be immersed in the solution four times, and be allowed to drain and dry between each immersion. Of paper thus prepared, a piece measuring one-eighth of an inch square placed within the lower eyelid commences to act in about twenty minutes and continues to produce its effect during several hours. Its presence in the eye occasions no uneasiness beyond that which is attributable to the drug.

A solution of the extract of Calabar Bean in glycerine made in the proportion of $2\frac{1}{2}$ grains of extract in 100 minims of pure glycerine, has also been tried and found to answer well, the glycerine in no way interfering with the action of the extract.

Further experiments may suggest still better preparations: for some hints respecting those here mentioned and for numerous careful observations upon them, I have to thank Mr. Charles John Workman of the Royal London Ophthalmic Hospital, Moorfields, and Mr. Bader of Guy's Hospital.—*Pharm. Journ. and Trans., June and July*, 1863, *with corrections by the author*. [See also "On the Employment of the Alkaloid of the Calabar Bean in Prolapsus of the Iris;" by T. Nunnely, Esq.—*Lancet*, *July* 18, 1863, *p*. 65.—Ed.]

* 'Bulletin de la Société de Pharmacie de Bruxelles,' Mars, 1863, p. 93.

† Mr. Streatfeild recommends *green* paper, as *white* paper when soaked with tears is not always easily distinguished from the conjunctiva.

ON THE GENUS CEODES OF FORSTER.

By Berthold Seemann, Ph.D., F.L.S.

Ceodes was first made known by Forster in his Char. Gen. p. 71, t. 71, in the year 1776, having been discovered on the 12th of August, 1774, on the island of Tanna, during Captain Cook's second voyage; but the genus has been entirely overlooked by Endlicher, Lindley, and even Choisy in De Candolle's 'Prodromus.' I have already stated (Bonplandia, x. p. 154, 1862) that I regard *Ceodes umbellifera*, as Forster first (Char. Gen.), and *C. umbellata* as he afterwards (Prodromus) called it, a species of *Pisonia*, which I have named *P. umbellifera*; but until now I have not been able to work up its synonymy.

It will be seen from the description and plates in the Char. Gen. p. and t. 71, that the specimens at Forster's disposal had only male flowers; and that he could give but an imperfect generic character, which has not allowed botanists who had no access to the original specimens to guess even the position of *Ceodes* in the natural system. Fortunately, there is a good set of the original specimens at the British Museum, and also a characteristic drawing of the whole plant made by Forster on the spot. These materials leave no doubt what Forster's plant, placed by him in the Linnæan Class *Polygamia*, really is, and by comparing them with others from the same region, I became convinced that *Ceodes* had a host of synonyms. To begin the work of rectification with my own species, I now hold that the specimens from Viti distributed by me under no. 364, and provisionally named *Pisonia viscida*, on account of the viscid nature of the *utriculus*, must be referred here. What has been figured and described in Meyen's plants (Nov. Act. Nat. Cur. xix. Suppl. p. 403, t. 51), under the name of *P. Forsteriana*, exactly represents the state of my specimens. Choisy erroneously referred *P. Forsteriana* to *P. inermis*. *P. excelsa*, Blume, from Java, is also a synonym. Nor does *P. Sinclairi*, Hook. f., from New Zealand, Norfolk Island, and New South Wales, of which a branch with hermaphrodite flowers is figured in the Flora of New Zealand, prove different. The same applies to *P. macrocarpa*, Presl, already referred to *P. excelsa* by Choisy and *P. Mooreana*, F. Mueller. We have therefore the following synonymy:—

Pisonia umbellifera, *Seem. in Bonpl.* x. *p.* 154 (1862). Ceodes um-

bellifera, *Forst. Char. Gen. p.* 71, *t.* 71 (1776). C. umbellata, *Forst. Prodr. p.* 93, *n.* 569 (1786); *Forst. Icon. ined. t.* 300! Pisonia excelsa, *Blum. Bijdr. p.* 735 (1825); *Choisy, in De Cand. Prodr.* xiii. *sect.* 2, *p.* 441 (1849). P. macrocarpa, *Presl, Symb. t.* 56 (1833). P. Forsteriana, *Endl. in Herb. Meyen, ex Schauer et Walp. Nova Acta Nat. Cur.* xix.; *Suppl. p.* 403, *t.* 51 (1843). P. Sinclairi, *Hook. f. Fl. New Zeal.* i. *p.* 209, *t.* 50 (1853). P. Mooreana, *F. Mueller, Fragm.* i. *p.* 20 (1858–59). Nomen vernaculum Javanicum, teste Blume, "Kitjauro;" Novo-Zelandicum, teste Hook. f., "Parapara."

The geographical range of this species is, like that of most of its congeners, very extensive. We have it from Java (*Horsfield! in Mus. Brit., Teijsmann!, Lobb! n.* 29), Philippine Islands (*Cuming! n.* 523), Timor (*Spanoghe*), Tanna (*J. R. and G. Forster!, W. Anderson! in Mus. Brit.*), Viti (*Seemann! n.* 364), New South Wales (*Cunningham! F. Mueller! Macarthur! Harvey! Bidwill!*), Norfolk Island (*Cunningham!*), Oahu, Sandwich Islands (*Seemann! n.* 2295, *Beechey!*), and Northern Island of New Zealand (*Sinclair! Colenso! Bauer!*). No locality is quoted for Meyen's specimen; it was probably picked up in the Philippine Islands.

Choisy (De Cand. Prodr. l. c.) says that this species is easily distinguished from *Pisonia Brunoniana*, Endl., by the leaves always being acute, not rounded at the base, which is certainly correct; but a much better distinction is, that in *P. Brunoniana* the fruit is covered with spines, and all the leaves are opposite, whilst in *P. umbellifera* the fruit is without spines and the upper leaves of the branches are in whorls.

The synonymy of *P. Brunoniana*, Endl. Fl. Norf. p. 43, demands some explanation. *P. Brunoniana* is undoubtedly identical with *P. inermis*, Forst. Prodr. p. 75, n. 397 (non Jacq.), collected in Tahiti. There are no specimens of Forster's plant at the British Museum, but there is a very good drawing of it by his own hand; and we have besides his manuscript notes, published by Guillemin in his 'Zephyrites Taitensis,' p. 39. Amongst Parkinson's coloured drawings of Tahitian plants, preserved at the British Museum, there is an excellent figure of this plant under the name of *P. grandis*, a name which R. Brown has adopted for the New Holland species, with which the Tahitian is perfectly identical. As Jacquin's *P. inermis* is a mere synonym of *P. mitis*, Linn. (*nigricans*, Swartz*), there is no reason why Forster's

* *P. mitis* of Linnæus has hitherto been looked upon as a very doubtful species

name, the oldest, should be set aside; and I therefore propose to arrange the synonymy as follows:—

Pisonia inermis, *Forst. Prodr. p.* 75, *n.* 397 (1786), *non Jacq. Forst. Icon. ined. t.* 285. P. grandis, *Parkinson, Drawings of Tahitian Plants, t.* 117, *ined.* P. grandis, *R. Brown, Prodr. Nov. Holl. p.* 422 (1810). P. procera, *Bertero, mss. in Guill. Zeph. Tait. p.* 39 (1837); *Deless. Icon. Select.* iii. *t.* 87. P. Brunoniana, *Endl. Fl. Norf. p.* 43, *n.* 88 (1833). F. Bauer, *Illust. Pl. Norf. t.* 145. Nomen vernaculum Tahitense, "Buatea," teste Guillemin.

The geographical range of this species extends from the Society Islands to the east coast of New Holland, and from the Sandwich Islands to Ceylon, viz. Tahiti (*Banks and Solander!*, *Forster*, *Bertero!*, *Moerenhout*, *Bidwill!*, *Barclay!*), Norfolk Island (*Ferd. Bauer!*), Viti (*Seemann! n.* 363), Lifuka, Tongan Islands (*Harvey!*), Sandwich Islands (*Herb. Hook.*), Bow Islands, Dangerous Archipelago (*Barclay!*), Colombo, Ceylon (*Thwaites!*), Pratas Islands (*Wilford!*), tropical parts of eastern Australia (*R. Brown! in Mus. Brit.*).

This examination reduces the *Pisonias* as yet discovered in Polynesia and Australasia to two species, which may be thus distinguished:—

P. umbellifera; foliis inferioribus oppositis, superioribus plerumque verticillatis, elliptico-oblongis v. oblongis acuminatis v. obtusis basi in petiolum angustatis, perianthiis fructiferis inermibus.

P. inermis; foliis omnibus oppositis ovatis v. oblongis obtusis vel acuminatis, perianthiis fructiferis spinulosis.

the doubt being increased by Sir J. Smith adding in the Linnean Herbarium to some specimens of the Indian form of *P. aculeata* the name of *P. mitis*, though Linnæus distinctly states his *mitis* to be *unarmed*. Some MSS. corrections, which Linnæus himself made in a copy of his second edition of the 'Species Plantarum,' p. 1511, preserved at the Linnean Society, corrections adopted by Murray, make it clear that Linnæus's *P. mitis* is quite identical with Jacquin's *P. inermis* and Swartz's *P. nigricans*. Linnæus adds in that place to his *P. mitis* "Jacq. Amer. 275," strikes out the words "Pisonia Malabarica non spinosa, Amm. Herb. 582. Katu Kava Walli, Rheed. Mal. 7, p. 33, t. 17?" substitutes for "Habitat in India" "Habitat in America," and finally adds: "Arbor alia hermaphr. sterilis, alia hermaphr. fertilis." Hence the synonymy of *P. mitis* would be:—*P. mitis*, Linn. Sp. Plant. ed. ii. p. 1511, exclud. syn. omnib. *P. nigricans*, Swartz, Prodr. p. 60; Fl. Ind. Occ. p. 643; De Cand. Prodr. xiii. p. 442. *P. inermis*, Jacq. Amer. p. 275, non Forst.

ON THE TOOT-POISON OF NEW ZEALAND.

By W. Lauder Lindsay, M.D., F.L.S.

During a tour through the New Zealand provinces in 1861–1862, I was struck with the abundant evidences, which everywhere presented themselves, of the ravages produced among the flocks and herds of the settlers by the *Toot-plant*, one of the most common indigenous shrubs of these islands. In many cases of losses by individual settlers brought under his notice, the amount of loss from this source alone had been from 25 to 75 per cent. In Otago, particularly, were such losses felt during the height of the gold mania there, from July to December, 1861: the traffic between Dunedin and Tuapeka gold-fields required the service of large numbers of bullocks, a great proportion of which were lost by Toot-poisoning. In colonies, which as yet, at least, have depended for their prosperity almost solely on pastoral enterprise, such losses form a material barrier to prosperity; and the concurrent testimony of the colonists in every part of New Zealand proves the great desirability of determining the nature of the Toot-poison, the laws of its action on man and the lower animals, and its appropriate antidotes or modes of treatment. With a view to assist in the attainment of these aims, the author had made notes, on the spot, of a large number of instances of the poisonous or fatal action of the plant on man—adults as well as children—and the lower animals, and had brought specimens home for chemical examination. The chief results of his investigations may be thus stated:—

1. The Toot-poison belongs to the class of *Narcotico-irritants*. *a*. Its action on man includes the following symptoms:—coma, with or without delirium; sometimes great muscular excitement or convulsions; the details differing in different individuals; during convalescence, loss of memory, with or without vertigo. *b*. In cattle and sheep, they include vertigo, stupor, delirium, and convulsions; curious staggerings and gyrations; frantic kicking, and racing or coursing; tremors.

2. The poisonous portion of the plant, (*a*) to man, is generally the *Seed*, which is contained in a beautiful, dark-purple, luscious berry, resembling the blackberry, which clusters closely in rich pendent racemes, and which is most tempting to children; occasionally the young *Shoots* of the plant, as it grows up in spring: (*b*) to cattle and sheep, in al-

most all cases, is the young *Shoot*, which is tender and succulent, resembling in appearance and taste the similar state of Asparagus.

3. The following *Peculiarities* exist in regard to the action of the Toot-poison :—*a.* A predisposition must exist, such predisposition being produced in cattle and sheep by some of the following conditions or circumstances:—The animal is *not habituated* to the use of the plant; it suddenly makes a large meal thereof after long fasting, or long feeding on drier and less palatable materials, or after exhaustion by hard labour or hot dry weather. From some such cause, the digestive system is deranged, and is susceptible of more serious disorder from the ingestion of food to which the animal is, at the time, unaccustomed. Hence Toot-poisoning frequently occurs in animals which have just been landed from a long and fatiguing sea-voyage, during which they have been underfed or starved, to whom the young Toot-shoots present the most juicy, fresh, pleasant diet. *b.* On the other hand, the same kinds of animals, *habituated* to the use of the Toot-plant, not only do not suffer at all, but for them it is regarded as quite equal in value to, and as safe as, clover as a pastoral food. It is an equal favourite with cattle and sheep, whether they have been habituated or not. *c.* The predisposition in man is probably produced by analogous conditions, repressing the tone of his nervous and digestive systems, or directly deranging them. *Children* are affected, out of all proportion to *adults*. *d.* Adults, who have suffered from the poisonous action of Toot, under certain circumstances, have been exempt from such action under certain others,—the same parts of the plant having been used, and apparently in the same way, in both sets of instances. Moreover, the Toot-berries enjoy, both among the Maoris and colonists, an enviable notoriety, on account of the agreeable and harmless wine and jellies they are capable of yielding, the former whereof, especially, has long been greatly prized. The *seeds*, however, in these cases, probably do not enter into the composition of the said wines or jellies.

4. The current *Remedies* for Toot-poisoning among the settlers are, in regard to—*a.* Cattle and sheep—mainly bleeding, by slashing the ears and tails. Belladonna has been variously tried, and favourably reported on; by others, stimulants are regarded as specifics (carbonate of ammonia, brandy, or a mixture of gin and turpentine, locally known as "drench"). Whatever be the nature of the remedy, there is no difference of opinion as to the necessity for the promptest treatment;

since, at a certain stage of the action of the poison, *all* remedies appear equally inefficacious. *b.* In man—the nature of the remedy is still more varied, though emetics and stimulants seem the most rational of those usually had recourse to.

5. The *Toot-* or *Tutu-*plant is the *Coriaria ruscifolia*, L. (the *C. sarmentosa*, Forst.). The plant is variously designated by Maoris and settlers in different parts of the New Zealand islands; and this of itself indicates how familiar it is, and how abundantly and widely distributed. The genus *Coriaria* is a small one, and, if not belonging to a subdivision of the Natural Order *Ochnaceæ*, probably represents a separate Order closely allied thereto and to the *Rutaceæ*. The most distinguished botanists, however, are at issue as to its precise place and alliances in the vegetable system. They are in similar dubiety as to the *species* of the genus, and the *varieties* of the species *C. ruscifolia*, L. In New Zealand there appear to be at least three *Coriarias*, which, while some botanists regard as mere varieties of *C. ruscifolia*, L., others consider separate species. The author had made, in July, 1862, an examination of all the species of the genus *Coriaria* contained in the Hookerian and Benthamian Collections at Kew, the result whereof was a strong conviction of the necessity for a critical revision of the whole genus, throughout all its species, wherever distributed. . . . In contrast to, and in connection with, the toxic action of *C. ruscifolia*, the author remarked on the better-known poisonous properties of *C. myrtifolia*, familiar as an adulterant of senna, and on those of other species of the genus *Coriaria*. He announced his belief that the whole genus *Coriaria* must be considered endowed with poisonous properties, probably of the narcotico-irritant class, and that, as such (especially in reference to the extent and importance of the economic losses caused by such species as Toot), it is eminently deserving of thorough scientific investigation.

Under this head he pointed out the fact that—*a.* While certain animals seem to be themselves exempt from, or insusceptible to, the action of the poison, they may, by feeding upon certain species, or certain parts of certain species, of *Coriaria*, and assimilating thereby or secreting the contained poison in their tissues, communicate poisonous effects, or become poisons, to man or the lower animals, to which they (the animals first mentioned) have become articles of diet. He cited a recent instance in connection with *C. myrtifolia*, in which several persons, near Toulouse, were poisoned by a dish of snails, which had been fat-

tened on its leaves and shoots.* *b*. That Royle, in reference to the fruits of *C. Nepalensis*; Peschier of Geneva, in regard to *C. myrtifolia*; and other authorities in regard to other species of *Coriaria*, have published instances of their *harmless* or even *beneficial* effects, under certain circumstances, on man or the lower animals. Such conflicting statements would appear to indicate that there are peculiarities in the action of the poisonous principles of all the *Coriarias*, or discrepancies in the records of instances of the said action, which discrepancies or peculiarities demand reconciliation or explanation at the hands of competent scientific experts.—*Abridged from Proceedings of British Association at Cambridge.*†

NEW PUBLICATIONS.

A Handbook of British Mosses; comprising all that are known to be natives of the British Isles. By the Rev. M. J. Berkeley, M.A., F.L.S. London: L. Reeve and Co.

A work written by one of our most talented cryptogamists, illustrated with coloured plates from the pencil of Fitch, and got up by Reeve and Co., could not fail to open for itself a market generally closed against ordinary scientific productions. It will interest a class of readers, not likely to be attracted by a scientific manual, in a tribe of neglected but extremely beautiful and curious plants, and its pages, as far as they go, will supply the materials for an intelligent acquaintance with them. But it is to be regretted that the author did not aim at something higher than the object he has had in view. It is a mistake to suppose that to be popular a work must be free from scientific precision. To be used for the determination of species, it cannot be too precise; and however popular the matter may be, if it is vague, the student will soon be compelled to seek for another guide. Mr. Berkeley does not usher in his volume with great expectations. He hopes "that it may be the means of calling attention of many to Wilson's 'Bryologia

* 'Medical Times and Gazette,' Sept. 13, 1862, p. 282.

† Professor Jameson, of Quito, lately sent to the Linnean Society a letter entirely written with ink consisting of the juice of the fruit of *Coriaria thymifolia*.

Britannica,' and that the slight sketch he presents may excite a wish to apply to the fountain-head for fuller information." To say that this has been accomplished, is to say but little, and we doubt whether much more can be said. Not a synonym is given, so that it is impossible to determine what species of other authors is meant, unless by turning to the 'Bryologia Britannica,' which however is invariably quoted. A little more labour would have made the work complete in itself, and of an independent value. Surely the explanation of the plates given at the end of the volume, and repeated without alteration, so as to occupy twenty-six pages at the beginning (for which the publishers have declared themselves responsible), had been better given only once, and in its proper place in connection with the plates. The space thus gained would have been well employed for synonymy in the body of the work.

The introduction is the most original, and not the least valuable, part of the volume. It contains a more clear and full account of the nature, structure, development, and distribution of Mosses than is to found in any other work in our language.

Mr. Berkeley introduces all the Continental genera which Wilson had used as sections or subgenera. Thus, for example, *Leskea*, which in the 'Bryologia Britannica' contains 9 native species, having some characters in common, although differing considerably among themselves, is divided into 8 genera, 6 of which are Schimper's, while the remaining 2 are here created for the reception of *L.* (*Philoscia*, Berk.) *latebricola*, and *L.* (*Platydictya*, Berk.) *Sprucei*. We doubt whether giving a generic name to every troublesome species is the best way to get over the difficulties of its affinities. Mr. Berkeley establishes two other new genera, *Bryella* and *Cycnea*, the first for *Phascum rectum*, the other for *Phascum curvicollum*. Among so many changes the want of synonymy is particularly puzzling. Take an example:—*Myurella julacea*, Sch., is not figured, but reference is given to "Wils. t. xxiv.; Eng. Bot. t. 2525;" Wilson's name, however, in the text and in his plate is *Leskea moniliformis*, and Smith's, *Pterogonium rotundifolium*.

Since Wilson published his 'Bryologia Britannica,' between 30 and 40 new British Mosses have been discovered; 8 of these are included in the 'Handbook,' but none of them are figured.

Prodromo della Flora Toscana, ossia Catalogo metodico delle Piante che nascono salvatiche in Toscana e nelle isole, o che vi sono estesamente coltivate, con la indicazione dei luoghi nei quali si trovano, del tempo loro fioritura e fruttificazione, dei loro nomi volgari ed usi; di Teodoro Caruel. Firenze, 1860–62. Paris and London: Baillière.

Mr. Theodore Caruel is of English descent, but was born, we believe, in Italy, and has held for some years an official position at the Museum of Natural History of Florence. In 1858 he published a very interesting commentary of Cæsalpinus' Herbarium, one of the oldest collections of dried plants existing, having been made about 200 years ago. Mr. Caruel is now engaged in bringing out a Prodromus of the Flora of Tuscany, two parts of which have already been issued, comprising the Thalamifloræ and Polypetalous Calycifloræ, in all about 900 species. Descriptions have been omitted, but the synonymy seems to be worked up with care, and the geographical distribution of the different plants is given with great minuteness. A number of critical remarks will render the work highly acceptable to those who make the European flora their special study.

The Prodromus is to be completed in four numbers, and will form a thick octavo volume, price about 20 francs.

Flora of Marlborough [*Wiltshire*]; *with Notices of the Birds, and a Sketch of the Geological Features of the Neighbourhood.* [By the Rev. T. A. Preston.] 12mo. 129 and xxiv. pages. London: Van Voorst. 1863.

The name of the author of this nice little book does not appear upon the title-page; but we learn from the preface that it is the production of the Rev. T. A. Preston, one of the masters of the college at Marlborough; also that it is compiled "mainly for the purpose of assisting those members of the college who may be fond of botany; and that any value which it may have beyond this is only what any ordinary list of the kind would possess." This is a modest form in which to place its claims to notice; for it is deserving of attention from British local botanical geographers.

Mr. Preston has divided the country to which his researches extend, a circle having a radius of six miles from Marlborough as a centre,

into four nearly equal districts, and endeavours to give a complete Flora of each of them. They are chiefly seated upon the chalk formation; containing much of the high chalk downs, Savernake forest, the water meadows in the valley of the river Kennet, and a portion of the Vale of Pewsey. The species are arranged and named as in Babington's 'Manual,' and much care has been taken to ensure accuracy in the nomenclature; to point out the authority for their introduction into the list; and also to distinguish the naturalized from the native plants. The number of plants recorded is about 520, the result of five years' examination of the district, during such time as the author could snatch from the arduous duties of a master in a large school. He modestly states his belief that many additions probably remain to be made to the list, and he trusts, by publishing it now, that he "may be enabled sooner to obtain assistance from those who have paid any attention to the subject;" and also have many new localities pointed out for some of the species.

Circumstanced as he is, in a position where he may succeed in causing boys to take an interest in botany and other of the natural sciences, by example, precept, and the help afforded to them by such a book as this, we certainly think that the author has done well to publish now, and not to wait for more completeness. Such additions and improvements as may be found necessary will probably soon be made, and we trust that so much interest in botany will spring up in the college that an early and enlarged second edition may be required.

BOTANICAL NEWS.

The following prize, offered by the Haarlem Society of Science, has been won by Dr. Gœppert, Professor of Botany at Breslau, it being the third time during the last twenty years that he has gained the prize of that Society:—"De quelle nature sont les corps solides observés dans des diamants; appartiennent-ils au règne minéral ou sont-ils des végétaux? Des recherches à ce sujet, quand même elles ne se rapporteraient qu'à un seul diamant, pourront être couronnées, quand elles auront conduit à quelque résultat intéressant."

Mr. Thomas Kirk, late of Coventry, an excellent British botanist, and well known to most of his fellow-workers, has arrived safely in New Zealand. He was obliged to emigrate on account of ill health, and proposes to collect in New Zealand. He writes, April 5th, from Auckland, that his health is much improved, and that he has made an excursion into the interior.

The new series of the 'Phytologist,' edited by Mr. Alexander Irvine, has been concluded with the sixth volume. "Speaking commercially," say the proprietors in their farewell address, "it has yielded no pecuniary profit; on the contrary, the owners have not been indemnified for the necessary expenses; the capital and labour expended have yielded no money returns. . . . The 'Phytologist' has been for nearly a quarter of a century almost the sole medium of communication among botanists who study or collect British plants. . . . That this has been useful to the present age, and will be more so to posterity, no one can or will dispute."

Dr. Reichenbach, fil., hitherto Professor of Botany at Leipzig, has been appointed Director of the Botanic Gardens at Hamburg; and Dr. Hofmeister, whose valuable work on the higher Cryptogams has been been made accessible to English readers through Mr. Currey's excellent translation, Professor of Botany and Director of the Botanic Garden at Heidelberg.

From a letter received by Mr. Daniel Hanbury from Dr. White, of Colon, New Granada, we learn with much regret that Mr. Sutton Hayes died at that place on the 19th of June, of phthisis, from which complaint he had been suffering for several years. Mr. Hayes was born in New York, where he studied and graduated in medicine. He then spent about two years in Paris, during which time he devoted much attention to botany. Upon his return to the United States, he was appointed assistant-surgeon to an exploring expedition sent by the Government to survey a route for emigrants to the Pacific States, the result of which was the laying out of a waggon road from El Paso to Fort Yuma, a process which occupied about two years. During this period Mr. Hayes made good use of his botanical knowledge, diligently occupying his spare time in collecting the plants of the region he was visiting. Symptoms of pulmonary consumption having for some time declared themselves in his constitution, he visited the Isthmus of Panama for the benefit of his health. Upon his arrival his state was so serious that it seemed improbable he could survive more than a few months, but the change to a warmer climate proved so beneficial that his life was prolonged for more than three years. The tropical vegetation of Central America afforded Mr. Hayes a rich field of labour and delight; he explored with a zeal and perseverance habitual to him, and to the astonishment of those who knew his infirm state of health. From his scientific friends, among whom his collections were distributed, the chief return which he asked was botanical information and spare books, and it was only a few months previous to his death that he was induced to send to England a few small sets of plants for sale. For a disinterested pursuit of science, a kindly wish to assist others, and an unrepining endurance of adverse circumstances, the name of Sutton Hayes should not be forgotten by his brother-botanists.

The two largest Chinchona plants on the Neilgherry Hills are producing flowers, and, as many more will shortly do the same, an early supply of seeds may be anticipated. On June 1st, 1863, the total number of plants on the Neilgherry Hills was 167,215, of which 43,028 were planted out. Applications for 61,250 plants had been made from various parts of India, and 2752 plants had already been distributed.

Botanical Society of Edinburgh.—*May 14th.*—Professor Maclagan, President, in the chair. 1. Description of New Genera and Species of Diatoms, from the South Pacific. By R. K. Greville, LL.D. 2. Experiments on the Fertilization of Orchids. By Mr. John Scott. After alluding to the more general phenomena of sterility manifested in the vegetable kingdom, and its supposed bearings on the "origin of species by means of natural selection," the author proceeded to state a few experiments on the fertilization of Orchids in further elucidation of the subject. The first of these was performed upon *Oncidium sphacelatum*. On one plant of this species he impregnated with its own pollen between one and two hundred flowers, yet in no instance did a single capsule swell. The only external indications of pollinic influence were the slightly earlier withering of the flowers and the closing of the stigmatic orifice; the latter usually taking place twenty-four hours after the application of the pollen. This stigmatic movement, he stated, was effected in two modes by the different species of *Oncidium*, viz. laterally by the closing of the sides and wings of the stigmatic orifice, and transversely by a gradual depression of the clinandrium, *O. sphacelatum* exhibiting the former, *O. divaricatum* the latter mode. He also stated that he had dissected the column of a number of the flowers operated upon as they dropped off, and invariably found an abundance of pollen-tubes. The second experiment was with pollen of *O. altissimum*, which he applied to *O. sphacelatum*; but in this he also failed in fertilizing a single capsule. Thirdly, he applied the pollen of *O. sphacelatum* to *O. graminifolium*, and succeeded in fertilizing a capsule on the latter, which contained about one-fourth of embryonated seeds. He did not succeed *vice versâ*. Fourthly, four flowers of *O. ornithorhynchum* were impregnated with pollen of *O. sphacelatum*, one of which produced a fine-looking capsule. On dissection, however, it was found to contain few seeds, and of these the majority presented only a loose transparent testa. The attempts to fertilize the latter with the former were again unsuccessful. The author here referred to the Verbascum cases mentioned by Darwin in his 'Origin of Species,' in which differently-coloured flowers are found to produce less seed when crossed than when fertilized with own pollen, and he contrasted them with his experiments on the species of *Oncidium*. Thus referring to the great predominance of yellow in the flowers of this genus, he remarked that the *O. sphacelatum*, with yellow-coloured flowers, fertilized *O. ornithorhynchum* with rose-coloured flowers, while other similarly-coloured species were not thus effective—a significant indication, he holds, that the normal conjunction of the sexual elements of varieties, and of a species on an individual of different species of a genus, is dependent on some deeper relational bond than either colour-differences or any yet recognized affinities; and that we cannot, with the least degree of certainty, predicate from such affinities the results of the above conjunctions. Fifthly, six flowers of *Oncidium sphacelatum* were impregnated with pollen of *O. divaricatum*, var. *cupreum*. Of these, four have produced five capsules, now nearly mature. These two species, however, as in the former cases, were not reciprocally active. "Thus," he remarked, "though I have failed in crossing reciprocally any two species, I have, nevertheless, I think, satisfactorily shown an individual self-impotence of organs capable of elimination by the action of other

species; and this in apparent disregard of recognized systematic affinities." Sixthly, *Maxillaria atrorubens* he found perfectly insusceptible of fertilization with its own pollen, and yet highly susceptible to that of the widely-separated *M. squalens*, the latter being also capable of fertilization with pollen from the former, which affords an illustration of the reciprocal action of species. He here stated that *M. squalens*, so far as his experience went, was perfectly productive when fertilized with its own pollen and remarked on the singularity of the fact that while the female element of an individual was insusceptible to its own pollinic influence, and susceptible to that from another individual of a distinct species, the latter should be alike susceptible to its own pollinic influence and to that of the former. 3. On some new British Lichens. By the Rev. T. Salwey, B.D. The author gives descriptions of various new species of British Lichens (some of which had been examined by Dr. Nylander). 4. Synopsis of the Canadian species of *Equisetum*. By George Lawson, LL.D., Queen's University of Canada. 5. Register of plants in flower in the open air at the Royal Botanic Garden (4th list). By Mr. James M'Nab. 6. Extract from a letter from William Jameson, Esq., Botanical Gardens, Saharunpore, N.W. Provinces, India, dated April 4, 1863:—"I have received from the Neilgherries four cases containing *Chinchona succirubra*, *C. Condaminea*, *C. micrantha*, *C. nitida*, and *C. Peruviana*. For these I have already selected sites on the Himalaya, in Western Gurhwal. Tea cultivation in the Kohistan of the north-western provinces and Punjab is now an established fact, and can no longer be considered an experiment, seeing that the out-turn this year will be equal to 500,000 lb., and in a few years it will be as many millions of pounds. Already some twenty companies have been formed." 7. Extract from a Letter from Mr. William Bell, Saharunpore:—"There is a plant of *Hibiscus tricuspis* here, one or two branches of which bear leaves and flowers widely different from the normal forms. In so far as I can learn, it came from Calcutta about twenty years ago, and it was some years old when the first of these abnormal branches made its appearance. I have been assured by one of the native gardeners that these branches were neither grafted on it nor budded. Whether it has inherited these peculiarities from any of its progenitors or not I do not know. It is not probable, as it was raised from seed and not from a cutting."

Dried Plants for Sale.—Dr. Schultz-Bipontinus, of Deidesheim, Germany, has still on hand a few complete sets of his European *Cichoriaceæ*, and disposes of the set (120 species), all, excellently preserved, fastened on white paper and accompanied by printed labels, at the rate of sixty francs. Applications should be made direct to Dr. Schultz.

Mr. Emden, of Frankfort, has just furnished an excellent photograph of George Forster, one of the naturalists of Captain Cook's second voyage. The photograph is taken from a chalk drawing made in Tahiti, and is six inches by four. Copies may be had for three shillings each, including carriage. Subscribers are requested to send their names to Dr. Seemann, 22, Canonbury Square, N., who has kindly consented to forward them to the publisher.—H.

Tab. 5

Fitch, del. et lith.

Vincent Brooks imp.

REVISION OF THE NATURAL ORDER BIGNONIACEÆ.

By Berthold Seemann, Ph.D., F.L.S.

(Plate IX.)

Dolichandra, *Cham.*

This genus, established by Chamisso in 1832, is the only *Catalpea* which climbs by means of tendrils, all other *Catalpeæ* being either trees or erect, winding, or rooting shrubs. De Candolle referred it, with a mark of doubt, to *Spathodea*, but with that genus, as now restricted, *Dolichandra* has nothing in common except tribal characters, the spathaceous calyx and the arrangement of the seeds in several rows. There is at present only one species known, *D. cynanchoides*, discovered by Sellow in Brazil, and the authentic specimens of which (with fruit attached!), preserved at the Royal Herbarium at Berlin, have been obligingly transmitted to me by the permission of his Excellency the Prussian Minister of Public Instruction, and have furnished the material for our plate, the only one as yet published of the genus. *Bignonia glutinosa*, De Cand., referred as a second species to *Dolichandra* by Mr. Miers* previously to the true type of the genus being known in this country, must be excluded.

Dolichandra.—*Calyx* spathaceus, vix inflatus, acute apiculatus, non cucullatus. *Corolla* tubulosa, leviter curvata, limbo bilabiato 5-lobo, lobis duobus superioribus adscendentibus, inferioribus reflexis. *Stamina* 4, didynama, cum rudimento quinti. *Antheræ* subparallelæ, glabræ. *Ovarium* lanceolatum, disco hypogyno semigloboso insidens, 2-loculare, multiovulatum. *Stylus* filiformis, exsertus. *Stigma* bilamellatum (v. abortu ut in figura nostra unilamellatum), lamellis anguste lanceolatis acutis. *Capsula* siliquæformis, compressa, lanceolata, utrinque acuta, lævis, loculicide dehiscens, septo coriaceo valvis contrario. *Semina* plana, alata, alis pellucidis, ad quodque septi latus pluriseriata.—Frutex *scandens*, Americæ australis; foliis *oppositis, trifoliolatis v. conjugato-bifoliolatis, cirrho 2–3-fido intermedio*, foliolis *ovatis v. oblongis, acutis, integerrimis, basi subcordatis;* floribus *cymosis*, cymis *axillaribus, 2–3-floris*, corollis *aurantiaco-rubro-purpureis*, genitalibus *exsertis*.—Dolichandra, *Cham. in Linnæa*, 1832, *p.* 657. Spathodeæ (?) sp., *De Cand.*—Species unica:—

* 'Annals and Magazine of Natural History,' March, 1861.

D. cynanchoides, Cham. l. c. (Tab. IX.) *Spathodea (?) Doliçhandra*, De Cand. Prodr. ix. p. 205.

Geog. Distr. Brazil (*Sellow! in Herb. Berol.*). La Plata States (*Baird!*, *Tweedie!*, *Gilbert!*, *Christie!*, *in Herb. Hook.*).

Explanation of Plate IX.

Dolichandra cynanchoides, Cham., from authentic specimens obligingly communicated by the Berlin Herbarium.—Fig. 1. Corolla, laid open. 2. Upper part of a stamen. 3. Pistil. 4. Transverse section of ovary. 5. Vertical section of ovary. 6. Theoretical transverse section of fruit. 7. Septum. 8. Seed. All, with the exception of fig. 1, 6, and 7, magnified.

ON THE BOTANY OF SOUTH PEMBROKESHIRE.

By Charles C. Babington, M.A., F.R.S., etc.

The district to which this paper refers is bounded upon three sides by the sea: towards the north by Milford Haven, from its mouth to Carew Castle, then by the brook which enters the haven at that place; and from the source of that brook, near East Williamston, an imaginary line is carried to the sea below St. Issells. Its length is about eighteen miles, and breadth about six. It is a bare and undulating country, with no lofty hills, very few trees or woods, and high banks, serving as fences, more frequently than hedges. Nearly the whole of the land is under cultivation; the chief exceptions being a considerable tract of furzy heath adjoining the sea in the south-western part of the district; one of sandy dunes at Castle Martin, another at Stackpole; and a few smaller tracts of similar character. The following plants may be mentioned as being especially the inhabitants of these sandy places:—*Thalictrum minus*, *Viola canina*, *Hieracium umbellatum*, *Convolvulus Soldanella*, *Carex arenaria*, *Psamma arenaria*, and *Triticum acutum*.

The actual coast is usually precipitous or even perpendicular, and the shore is seldom accessible without difficulty at any places except those where the brooks find their way to the sea. The shores of Milford Haven are not so continuously rocky, but the beach is formed of pebbles. The following plants occur upon the rocks:—*Matthiola sinuata*, *Lavatera arborea*, *Sedum Telephium*, *Inula crithmoides*, and *Statice occidentalis*. Upon the beach, which is often very narrow, and not rarely absent altogether, may be found *Glaucium luteum*, *Cakile maritima*, *Cochlearia Danica*, *Senebiera Coronopus*, *S. didyma*, *Lepigonum rupestre*, *Eryngium maritimum*, *Carduus tenuiflorus*, *Atriplex Babing-*

tonii, *Beta maritima*, *Salsola Kali*, *Polygonum Raii*, *Euphorbia Portlandica*, *Juncus acutus*, and *J. maritimus*.

The arm of the haven which extends up to Pembroke has, on its southern side, extensive mud flats which are flooded at spring tides, and produce some of the plants usually to be found in such places; for instance, *Artemisia maritima*, *Statice Bahusiensis*, and *Suæda maritima*.

Ponds and bogs are rare, and therefore there is a deficiency of aquatic plants; but there are two marshy districts of considerable size, both of which seem to have been subject to the overflow of the tide at no very distant period. One of the low tracts extends from Tenby to St. Florence, and is about three miles in length, but usually very narrow; the other is called Castle Martin Corse, and is situated near to the village of that name; it also does not exceed three miles in length, and is narrow. The former of these marshes, never having been well drained, has always continued in the condition of rough pasture, and presents, therefore, a fair specimen of the vegetation occurring upon such spots; the latter was very completely drained about sixty years since, and much of it converted into arable land, and although it has now fallen back into the state of coarse wet pasture, it is nearly deprived of all its peculiar plants, a few only of them remaining in the ditches. The following plants were more especially noticed in these marshes:—*Caltha palustris*, *Ranunculus heterophyllus*, *R. confusus*, *R. Flammula*, *R. hederaceus*, *R. Lingua*, *R. sceleratus*, *Drosera rotundifolia*, *Comarum palustre*, *Myriophyllum spicatum*, *Helosciadium inundatum*, *Galium palustre*, *Menyanthes trifoliata*, *Pedicularis palustris*, *Rumex Hydrolapathum*, *Narthecium ossifragum*, *Alisma Plantago*, *A. ranunculoides*, *Sparganium ramosum*, *S. simplex*, and *Eleocharis palustris*.

In some parts of the district the farming is good, but very frequently the farmer has favoured the botanist so far as to allow weeds to spread to a great extent over his arable land, and the hedgerows seem usually to be left to nature.

The geological structure of the tract under notice presents alternating bands of the Upper Silurian, Old Red Sandstone, and Mountain Limestone formations. Coal is worked in its north-eastern part.

Until recently, we knew nothing concerning the plants inhabiting this district. In the 'Botanist's Guide' of Messrs. Turner and Dillwyn, forty-eight plants are recorded as growing in Pembrokeshire; to these

Mr. Watson only adds one species in his 'New Botanist's Guide:' a few additions are noticed in the same author's 'Cybele Britannica.'

In the year 1848, a little tract, entitled 'Contributions towards a Catalogue of Plants indigenous to the neighbourhood of Tenby,' was published by my friend Dr. R. W. Falconer. In it he records the observation of 388 species in the neighbourhood of that town. As Dr. Falconer's book was printed solely that the materials which he had collected might not be lost, when a change of residence deprived him of his "long-cherished hope" of publishing a perfect catalogue of the native plants to be met with near Tenby, it cannot cause surprise that I was able to add largely to it during two visits to that town. The number of Tenby plants now amounts to about 550, nearly all of which were observed by myself. Doubtless more remain to be found by persons possessing better opportunities of examining the country.

Circumstances greatly favoured my examination of the western part of South Pembrokeshire, where I was most hospitably received by influential inhabitants. I am thus enabled to give a tolerably complete catalogue of the plants.

It was originally my intention to have included in one paper a catalogue of all the plants which have been found in the county of Pembroke, but, upon mature consideration, it seems desirable to leave the formation of a list of North Pembrokeshire plants to some other person. That interesting district is sure to supply many species which have as yet escaped notice.

All the plants noticed in the district are recorded in the following list, not in order to render it more extensive, but from the consideration that a knowledge of the common plants has at least as great an interest to the botanical geographer as attaches to the rarer ones. As most of the plants are to be found throughout the district, localities are generally omitted.

I am indebted for some localities to the Misses Smith, of Gomfreston, who have paid much attention to the botany of their own neighbourhood.

RANUNCULACEÆ.

Clematis Vitalba, *L.*
Thalictrum minus, *L.*
Anemone nemorosa, *L.* Gomfreston Glebe, *the Misses Smith.*
Ranunculus heterophyllus, *Sibth.*
R. confusus, *Godr.* Marsh at Tenby and Stackpole.
R. cœnosus, *Guss.* (R. Lenormandi, *Sch.*)
R. sceleratus, *L.*
R. Flammula, *L.*
R. Lingua, *L.*

R. Ficaria, *L.*
R. acris, *L.*
R. repens, *L.*
R. bulbosus, *L.*
R. hirsutus, *Curt.* Near Tenby.
R. arvensis, *L.* Gomfreston, *the Misses Smith.*
Caltha palustris, *L.*
Helleborus viridis, *L.* Lodge Park, near Stackpole, *Bot. Guide.*
Aquilegia vulgaris, *L.*

PAPAVERACEÆ.

Papaver Rhœas, *L.*
Glaucium luteum, *Scop.*
Chelidonium majus, *L.*

FUMARIACEÆ.

Fumaria pallidiflora, *Jord.*
F. confusa, *Jord.*
F. officinalis, *L.*

CRUCIFERÆ.

Matthiola sinuata, *R. Br.* Slope above the eastern end of Lidstep Haven. East Freshwater Bay. Near Pembroke, *Sm. Fl. Brit.*
Cheiranthus Cheiri, *L.*
Nasturtium officinale, *L.*
Barbarea vulgaris, *L.*
Arabis hirsuta, *L.*
A. ciliata, *R. Br.* Lidstep Haven.
Cardamine pratensis, *L.*
Hesperis matronalis, *L.* On stony ground near Amroth Castle, *the Misses Smith.*
Sisymbrium officinale, *Scop.*
Alliaria officinalis, *Andrzj.*
Erysimum cheiranthoides, *L.*
Brassica campestris, *L.*
B. oleracea, *L.* Sea cliffs at Tenby. Perhaps an escape from cultivation.
Sinapis nigra, *L.*
S. arvensis, *L.*
S. albr, *L.*
Diplotaxis tenuifolia, *De Cand.* Tenby.
Draba verna, *L.*
Cochlearia officinalis, *L.* Castle Hill, Tenby, *Dr. Falconer.*
C. Anglica, *L.* Rocks by the south shore, Tenby, *Dr. Falconer.*
C. Danica, *L.*
Armoracia rusticana, *Rupp.* Tenby. An escape from cultivation.
Hutchinsia petræa, *R. Br.* Tenby, and on a limestone wall about two miles from Pembroke, *Bot. Guide.* Stackpole Court.
Lepidium Smithii, *Hook.* Common near Tenby.
Capsella Bursa-pastoris, *De Cand.*
Senebiera Coronopus, *Poiret.* Tenby.
S. didyma, *Pers.* Tenby.
Cakile maritima, *Scop.* Cliffs at Tenby.
[Crambe maritima, *L.* Cliffs at Tenby, *Bot. Guide.* Apparently an error.]
Raphanus Raphanistrum, *L.*

RESEDACEÆ.

Reseda suffruticulosa, *L.* *R. alba* of Falconer's list. Tenby, *Dr. Falconer.* Not a native.
R. luteola, *L.* Tenby.

CISTACEÆ.

Helianthemum vulgare, *Gærtn.*

VIOLACEÆ.

Viola palustris, *L.* Valley above Wiseman's Bridge.
V. odorata.
V. hirta, *L.*
V. sylvatica, *Fries.*
V. canina, *L.*
V. tricolor, *L.*

DROSERACEÆ.

Drosera rotundifolia, *L.* Islands, *the Misses Smith.*

POLYGALACEÆ.

Polygala vulgaris, *L.*

Caryophyllaceæ.

Saponaria officinalis, *L.* Near Tenby.
Silene inflata, *Sm.*
S. maritima, *With.*
Lychnis Flos-cuculi, *L.*
L. vespertina, *Sibth.* Near Penally.
L. diurna, *Sibth.*
Sagina procumbens, *L.*
S. apetala, *L.*
S. maritima, *Don.* Sands west of Tenby, and near Saundersfoot, *Dr. Falconer.*
S. nodosa, *E. Meyer.*
Honkeneja peploides, *Ehrh.*
Arenaria trinervis, *L.* Tenby.
A. serpyllifolia, *L.*
Stellaria graminea, *L.* Tenby.
S. media, *With.*
Cerastium glomeratum, *Thuil.*
C. triviale, *Link.*
C. semidecandrum, *L.*
C. tetrandrum, *Curt.* Near the sea at Tenby.

Malvaceæ.

Althæa officinalis, *L.* Marsh near Pembroke Road at Tenby, *Dr. Falconer.*
Lavatera arborea, *L.* Caldy Island, *Bot. Guide.* Cliffs at Tenby. Cliffs to the west of Stackpole.
Malva moschata, *L.*
M. rotundifolia, *L.*
M. sylvestris, *L.*

Hypericaceæ.

Hypericum Androsæmum, *L.*
H. quadrangulum, *L.*
H. perforatum, *L.*
H. humifusum, *L.*
H. hirsutum, *L.*
H. montanum, *L.*
H. pulchrum, *L.*
H. elodes, *L.* Penally Marsh.

Geraniaceæ.

Geranium dissectum, *L.*
G. molle, *L.*
G. columbinum, *L.*
G. lucidum, *L.*
G. Robertianum, L.
Erodium cicutarium, *Sm.*
E. moschatum, *Sm.* Near the rock on Penally Sands.

Linaceæ.

Linum angustifolium, *Huds.*
L. catharticum, *L.*

Oxalidaceæ.

Oxalis Acetosella, *L.*

Leguminosæ.

Ulex Europæus, *L.*
U. nanus, β. Gallii, *Planch.* This is the *U. nanus* of Falconer's Catalogue.
Genista Anglica, *L.* Hedges between Rhydberth and New Bridge Inn, *Dr. Falconer.*
Sarothamnus scoparius, *Koch.* Rhydberth Common, *Dr. Falconer.* Tenby.
Ononis arvensis, *L.*
Medicago lupulina, *L.*
M. maculata, *Sibth.*
Melilotus officinalis, *Willd.* Tenby.
Trifolium pratense, *L.*
T. medium, *L.*
T. arvense, *L.*
T. scabrum, *L.*
T. repens, *L.*
T. procumbens, *L.*
T. minus, *Sm.*
T. filiforme, *L.*
Lotus corniculatus, *L.*
L. major, *Scop.*
Anthyllis Vulneraria, *L.*
A. Vulneraria, β. Dillenii, *Bab.*
Vicia hirsuta, *Koch.*
V. tetrasperma, *Mœnch.*
V. Cracca, *L.*
V. sepium, *L.*
V. sativa, *L.*
Lathyrus pratensis, *L.*

L. macrorrhizus, *Wimm.*
Ornithopus perpusillus, *L.* Burrows, near Tenby.

ROSACEÆ.

Prunus communis, *Huds.*
P. Cerasus, *L.* Near Tenby, but rare.
Spiræa Ulmaria, *L.*
Poterium Sanguisorba, *L.* Near Tenby.
Agrimonia Eupatoria, *L.*
Alchemilla arvensis, *L.*
Potentilla anserina, *L.*
P. reptans, *L.*
P. Tormentilla, *Nesl.*
P. Fragariastrum, *Ehrh.*
Comarum palustre, *L.* Penally Marsh.
Fragaria vesca, *L.*
Rubus plicatus, *W. and N.* Near Saundersfoot.
R. Lindleianus, *Lees.*
R. affinis, *W. and N.*
R. rhamnifolius, *W. and N.*
R. thyrsoideus, *Wimm.*
R. discolor, *W. and N.*
R. leucostachys, *Sm.*
R. macrophyllus, α. umbrosus, *Arrh.*
R. Hystrix, *Weihe.*
R. Radula, *Weihe.*
R. rudis, *Weihe.*
R. Kœhleri, *Weihe.*
R. Kœhleri, β. pallidus, *Bab.*
R. corylifolius, *Sm.*
R. cæsius, *L.*
Geum urbanum, *L.*
G. rivale, *L.* Gomfreston Marshes, *the Misses Smith.*
Rosa spinosissima, *L.* Penally Burrows.
R. tomentosa, *Sm.*
R. canina, *L.*
R. arvensis, *Huds.*
Cratægus Oxyacantha, *L.*
Pyrus Malus, *L.*

LYTHRACEÆ.

Lythrum Salicaria, *L.*

ONAGRACEÆ.

Epilobium hirsutum, *L.*
E. parviflorum, *Schreb.*
E. montanum, *L.*
E. palustre, *L.*
E. tetragonum? This may have been E. obscurum, *Schreb.*
Circæa Lutetiana, *L.*

HALORAGACEÆ.

Myriophyllum spicatum, *L.* Stackpole. I did not find *M. verticillatum* near Tenby, and it is probably named in place of *M. spicatum* in Falconer's Catalogue.

PARONYCHIACEÆ.

Lepigonum rubrum, *Fr.*
L. rupestre, *Kindb.*

CRASSULACEÆ.

Sedum Telephium, *L.* Saundersfoot, *Dr. Falconer.* Near Manorbier.
[S. dasyphyllum, *L.*, is mentioned by Falconer, but I think it does not exist in the places mentioned by him.]
S. acre, *L.*
S. Anglicum, *Huds.*
S. reflexum, *L.*
Sempervivum tectorum, *L.* On roofs, but probably planted.
Cotyledon Umbilicus, *L.*

SAXIFRAGACEÆ.

Saxifraga tridactylites, *L.* This appears to be common upon wall-tops near Tenby. I was there at too late a season of the year to see it.
Chrysosplenium oppositifolium, *L.* Near Crackwell and near St. Florence, in damp places, *Dr. Falconer;* Stackpole.

UMBELLIFERÆ.

Hydrocotyle vulgaris, *L.*

Sanicula Europæa, *L.*
Eryngium maritimum, *L.*
Apium graveolens, *L.* Tenby.
Helosciadium nodiflorum, *Koch.*
H. inundatum, *Koch.* Tenby.
Sison Amomum, *L.*
Pimpinella Saxifragra, *L.*
Œnanthe crocata, *L.* Tenby.
Œ. Lachenalii, *Gmel.* Marshes, especially were they are sandy.
Æthusa Cynapium, *L.*
Fœniculum officinale, *All.* Tenby, but probably not a native.
Crithmum maritimum, *L.* Near to the sea.
Angelica sylvestris, *L.*
Pastinaca sativa, *L.*
Heracleum Sphondylium, *L.*
Daucus Carota, *L.*
Torilis Anthriscus, *Gært.*
T. nodosa, *Gært.* Penally.
Scandix Pecten-Veneris, *L.*
Anthriscus sylvestris, *Hoffm.* This is common; but the *A. vulgaris* recorded by Mr. T. B. Flower as growing near Tenby was not noticed by me.
Chærophyllum temulum, *L.*
Conium maculatum, *L.*
Smyrnium Olusatrum, *L.* Manorbier and Carew Castles.

ARALIACEÆ.

Adoxa Moschatellina, *L.* Between St. Florence and the Ridgeway, *Dr. Falconer.*
Hedera Helix, *L.*

CORNACEÆ.

Cornus sanguinea, *L.*

CAPRIFOLIACEÆ.

Sambucus nigra, *L.*
Viburnum Opulus, *L.* St. Issells.
V. Lantana, *L.*
Lonicera Periclymenum, *L.* [*L. xylosteum* is recorded by Falconer, but is not a native of the district.]

RUBIACEÆ.

Sherardia arvensis, L.
Asperula cynanchica, *L.* Hillside above the breakwater at Tenby.
Galium Aparine, *L.*
G. Mollugo, *L.* Tenby, *Mr. T. B. Flower.*
G. verum, *L.*
G. saxatile, *L.*
G. uliginosum, *L.* Tenby, *Mr. T. B. Flower.*
G. palustre, *L.* Marsh on the way from Tenby to Penally.
Rubia peregrina, *L.*

VALERIANACEÆ.

Centranthus ruber, *De Cand.* Walls of Tenby.
Valeriana officinalis, *L.* Near Cornish Down and near Causeway Mill, *Dr. Falconer.*
Valerianella dentata, *Deitr.*
Dipsacus sylvestris, *L.* Accidentally misnamed *D. fullonum* by Falconer.
Knautia arvensis, *Coult.*
Scabiosa succisa, *L.*
S. Columbaria, *L.* Tenby, *Dr. Falconer.*

COMPOSITÆ.

Eupatorium cannabinum, *L.*
Petasites vulgaris, *Desf.*
Tussilago Farfara, *L.*
Aster Tripolium, *L.* Salt marshes.
Erigeron acris, *L.*
Bellis perennis, *L.*
Solidago Virgaurea, *L.*
Inula Helenium, *L.* Hollow ways near Tenby.
I. Conyza, *De Cand.* Near Tenby.
I. crithmoides, *L.* Giltar Head.
Pulicaria dysenterica, *Gært.* Near Tenby.

Bidens cernua, *L.* Marshes.
Anthemis Cotula, *L.*
A. nobilis, *L.*
Achillea Millefolium, *L.*
A. Ptarmica, *L.*
Chrysanthemum leucanthemum, *L.*
C. segetum, *L.*
Matricaria Parthenium, *L.* Near Tenby.
M. inodora, *L.*
M. Chamomilla, *L.*
Artemisia Absinthium, *L.*
A. maritima, *L.* Pwllchroghan.
A. vulgaris, *L.* Near Tenby.
Tanacetum vulgare, *L.*
Filago Germanica, *L.*
F. minima, *Fr.*
Gnaphalium uliginosum, *L.*
Senecio vulgaris, *L.*
S. sylvaticus, *L.* Near Tenby.
S. erucifolius, *L.*
S. Jacobæa, *L.*
S. aquaticus, *Huds.* Marshes.
Carlina vulgaris, *L.*
Arctium majus, *Schk.* Near Tenby.
A. minus, *Schk.*
Serratula tinctoria, *L.* Saundersfoot.
Centaurea nigra, *L.*
C. Scabiosa, *L.*
Onopordum Acanthium, *L.* Near Tenby.
Carduus nutans, *L.*
C. crispus, *L.*
C. tenuiflorus, *Curt.*
C. lanceolatus, *L.*
C. eriophorus, *L.* Tenby, *Dr. Falconer.*
C. arvensis, *Curt.*
C. palustris, *L.*
Lapsana communis, *L.*
Cichorium Intybus, *L.*
Hypochæris glabra, *L.* Near Tenby, *Dr. Falconer.*
H. radicata, *L.*
Thrincia hirta, *De Cand.*
Apargia hispida, *Willd.*
A. autumnalis, *Willd.*
Tragopogon minor, *Fries.* Trefloyn.
Picris hieracioides, *L.*
Helminthia echioides, *Gært.* Between Scotchborough and Cornish Mill.
Lactuca muralis, *De Cand.*
Leontodon Taraxacum, *L.*
Sonchus oleraceus, *L.*
S. asper, *Hoffm.*
S. arvensis, *L.*
Crepis virens, *L.*
Hieracium Pilosella, *L.*
H. cæsium, *Fries.* Rock, near South Shore, Tenby.
H. boreale, *Fries.*
H. umbellatum, *L.* Saundersfoot, and sands near Giltar Head.

CAMPANULACEÆ.

Campanula rotundifolia, *L.*
Jasione montana, *L.*
Wahlenbergia hederacea, *Reich.* Near Wiseman's Bridge, *the Misses Smith.*

ERICACEÆ.

Calluna vulgaris, *Salisb.*
Erica Tetralix, *L.* Penally Marsh.
E. cinerea, *L.*

AQUIFOLIACEÆ.

Ilex Aquifolium, *L.*

OLEACEÆ.

Ligustrum vulgare, *L.*
Fraxinus excelsior, *L.*

APOCYNACEÆ.

Vinca minor, *L.* A doubtful native, near Saundersfoot, *Dr. Falconer.*

GENTIANEÆ.

Erythræa pulchella, *Fries.* Near Tenby.
E. Centaurium, *Pers.*
Cicendia filiformis, *Reich.* Penally.
Gentiana Amarella, *L.*
G. campestris, *L.* Giltar Head.

Menyanthes trifoliata, *L.* Penally Marsh.

CONVOLVULACEÆ.

Convolvulus arvensis, *L.*
C. sepium, *L.*
C. Soldanella, *L.* The Burrows, near Tenby.

BORAGINACEÆ.

Cynoglossum officinale, *L.* Lidstep.
Borago officinalis, *L.* Near Tenby and Angle.
Lycopsis arvensis, *L.* Near Tenby, *Dr. Falconer.*
Symphytum officinale, *L.* Near Tenby, *Dr. Falconer*
Echium vulgare, *L.*
Lithospermum officinale, *L.*
L. arvense, *L.* Near Tenby, *Dr. Falconer.*
Myosotis repens, *Don.* This is probably the *M. palustris* of Falconer.
M. cæspitosa, *Schultz.* Penally Marsh.
M. arvensis, *Hoffm.*
M. versicolor, *Ehrh.* Castle Hill, Tenby, *Dr. Falconer.*

SOLANACEÆ.

Solanum Dulcamara, *L.* Near Tenby.
Hyoscyamus niger, *L.*
Datura Stramonium, *L.* Near Tenby; but a doubtful native.

OROBANCHACEÆ.

Orobanche Hederæ, *Duby.* Near Tenby.
O. Picridis, *W. F. Schultz.* Near Giltar Head.

SCROPHULARIACEÆ.

Verbascum Thapsus, *L.*
V. Blattaria, *L.* Walls of Tenby.
Digitalis purpurea, *L.*
Antirrhinum majus, *L.* Walls of Tenby.
Linaria Cymbalaria, *Mill.*
L. Elatine, *Mill.* Penally.
L. spuria, *Mill.* Islands Farm, *the Misses Smith.*
L. repens, *Ait.* Tenby.
L. vulgaris, *Mill.*
Scrophularia nodosa, *L.*
S. aquatica, *L.*
Melampyrum pratense, *L.* St. Issells.
Pedicularis palustris, *L.*
P. sylvatica, *L.*
Rhinanthus Crista-galli.
Euphrasia officinalis, *L.*
E. Odontites, *L.*
Veronica scutellata, L. Near Tenby, *Dr. Falconer.*
V. Anagallis, *L.*
V. Beccabunga, *L.*
V. Chamædrys, *L.*
V. officinalis, *L.*
V. serpyllifolia, *L.*
V. arvensis, *L.*
V. agrestis, *L.*
V. polita, *Fries.*
V. hederifolia, *L.*

LABIATÆ.

Mentha rotundifolia, *L.* St. Issells churchyard.
M. aquatica, *L.*
M. arvensis, *L.*
Lycopus Europæus, *L.*
Salvia verbenaca, *L.*
Origanum vulgare,
Thymus Serpyllum, *L.*
Calamintha officinalis, *Mœnch.* This is probably the *C. Nepeta* of Falconer.
C. Acinos, *Clair.*
C. Clinopodium, *Benth.*
Scutellaria galericulata, *L.*
S. minor, *L.* Near Tenby, *Dr. Falconer.*
Prunella vulgaris, *L.* Penally.
Nepeta Glechoma, *Benth.*
Lamium album, *L.*
L. Galeobdolon, *Crantz.* Near Tenby, *Dr. Falconer.*
L. purpureum, *L.*
L. incisum, *Willd.* Near Tenby, *Dr. Falconer.*

L. amplexicaule, *L.*
Leonurus Cardiaca, *L.* Penally.
Galeopsis Ladanum, *L.*
G. Tetrahit, *L.*
Stachys Betonica, *Benth.*
S. sylvatica, *L.*
S. palustris, *L.*
S. arvensis, *L.*
Ballota fœtida, *Lam.*
Marrubium vulgare, *L.* Near Tenby.
Teucrium Scorodonia, *L.*
Ajuga reptans, *L.*

Verbenaceæ.

Verbena officinalis, *L.*

Lentibulareæ.

Utricularia minor. *L.*

Primulaceæ.

Primula veris, *L.*
P. vulgaris, *Huds.*
Cyclamen hederifolium, *Willd.* Stackpole, not a native.
Lysimachia Nummularia, *L.* Daisy Bank, near Tenby, *the Misses Smith.*
L. nemorum, *L.* St. Issells.
L. vulgaris, *L.* Penally Marsh.
Anagallis arvensis, *L.*
A. tenella, *L.* Penally.
Glaux maritima, *L.* Tenby Burrows.
Samolus Valerandi. Tenby Marsh.

Plumbaginaceæ.

Statice occidentalis, *Lloyd.* Giltar Head.
S. Bahusiensis, *Fries.* Pwllchroghan.
Armeria maritima, *Willd.*

Plantaginaceæ.

Plantago Coronopus, *L.*
P. maritima, *L.*
P. lanceolata, *L.*
P. media, *L.* Tenby, *Dr. Falconer.*
P. major, *L.*

Chenopodiaceæ.

Suæda maritima, *Dum.* Pwllchroghan.
Salsola Kali, *L.* Penally Burrows.
Chenopodium album, *L.*
C. murale, *L.*
C. Bonus-Henricus, *L.* Near Tenby.
Beta maritima, L. Giltar Head and Tenby.
Salicornia herbacea, *L.* Tenby Marsh and Pwllchroghan.
Atriplex angustifolia, *Sm.*
A. erecta, *Huds.*
A. deltoidea, *Bab.*
A. Babingtonii, *Woods.*

Polygonaceæ.

Rumex conglomeratus, *Murr.*
R. sanguineus, *L.*
R. pulcher, *L.* Penally.
R. obtusifolius, *L.*
R. crispus, *L.*
R. Hydrolapathum, *Huds.* Penally Marsh.
R. acetosa, *L.*
R. Acetosella, *L.*
Polygonum amphibium, *L.*
P. lapathifolium, *L.*
P. Persicaria, *L.*
P. Hydropiper, *L.*
P. aviculare, *L.*
P. Raii, *Bab.* Tenby.
P. Convolvulus, *L.*

Euphorbiaceæ.

Euphorbia Helioscopia, *L.*
E. amygdaloides, *L.* St. Issells.
E. Paralias, *L.*
E. Portlandica, *L.* Lidstep.
E. Peplus, *L.*
E. exigua, *L.*
Mercurialis annua, *L.*
M. perennis, *L.*

Callitrichaceæ.

Callitriche verna, *L.*
C. platycarpa, *Kütz.*
C. hamulata, *Kütz.*

URTICACEÆ.

Parietaria diffusa, *Koch.*
Urtica dioica, *L.*
U. urens, *L.*
Humulus Lupulus, *L.* Near Tenby.

ULMACEÆ.

Ulmus suberosa, *Ehrh.*

AMENTIFERÆ.

Salix alba, γ. vitellina, *Sm.*
S. cinerea, β. aquatica, *Sm.*
S. pentandra, *L.*
Populus canescens, *Sm.* Castle Martin.
Myrica Gale, *L.* Penally Marsh.
Alnus glutinosa, *L.*
Fagus sylvatica, *L.*
Quercus Robur, *L.*
Q. Robur, γ. sessiliflora, *Sm.*
Corylus Avellana, *L.*

DIOSCOREACEÆ.

Tamus communis, *L.*

ORCHIDACEÆ.

Orchis mascula, *L.*
O. maculata, *L.*
O. pyramidalis, *L.*
Habenaria bifolia, *R. Br.*
Spiranthes autumnalis, *Rich.*
Listera ovata, *R. Br.*

IRIDACEÆ.

Iris Pseudacorus, *L.*

AMARYLLIDACEÆ.

Narcissus Pseudo-narcissus, *L.* Near Tenby, *Dr. Falconer.*
Galanthus nivalis, *L.* Stackpole, *Bot. Guide.*

ASPARAGACEÆ.

Asparagus officinalis, *L.* Giltar Head. (A. prostratus, *Dum.*)
Polygonatum officinale, *All.* Rock on Tenby Warren.

LILIACEÆ.

Scilla verna, *Huds.* Giltar Head and Lidstep.
Allium ursinum, *L.*
A. vineale, *L.*
Ornithogalum umbellatum, *L.* Stackpole, *Bot. Guide.*

COLCHICACEÆ.

Colchicum autumnale, *L.* Black Pool, near the Clethey, *the Misses Smith.*

JUNCACEÆ.

Narthecium ossifragum, *Huds.* Gomfreston Marsh, *the Misses Smith.*
Juncus maritimus, *Sm.* Penally Sands.
J. acutus, *L.* Penally Sands.
J. effusus, *L.*
J. conglomeratus, *L.*
J. glaucus, *Sibth.*
J. obtusiflorus, *Ehrh.*
J. acutiflorus, *Ehrh.*
J. lamprocarpus, *Ehrh.*
J. supinus, *Mœnch.*
J. bufonius, *L.*
Luzula sylvatica, *Bich.*
L. campestris, *Willd.*
L. pilosa, *Willd.*

ALISMACEÆ.

Alisma Plantago, *L.*
A. ranunculoides, *L.*
Sagittaria sagittifolia, *L.*
Triglochin maritimum, *L.*
T. palustre, *L.*
Butomus umbellatus, *L.* Stackpole.

TYPHACEÆ.

Sparganium ramosum, *Huds.*
S. simplex, *Huds.*
Typha latifolia, *L.*

ARACEÆ.

Arum maculatum, *L.*

LEMNACEÆ.

Lemna minor, *L.*
L. trisulca, *L.*

POTAMOGETONACEÆ.

Potamogeton natans, *L.*
P. plantagineus, *Ducr.* Castle Martin Corse.
P. crispus, *L.* Near Tenby.
P. pusillus, *L.* Near Tenby.
P. pectinatus, *L.* Stackpole.
Ruppia rostellata, *Koch.* Near Tenby.
Zannichellia palustris, *L.* Near Tenby.

NAIADACEÆ.

Zostera marina, *L.* Pwllchroghan.

CYPERACEÆ.

Cladium Mariscus, *R. Br.* Marsh at Penally.
Eleocharis palustris, *R. Br.* Stackpole.
Scirpus Tabernæmontani *Gm.* Marsh near Tenby.
S. Savii, *S. and M.*
Carex arenaria, *L.*
C. vulpina, *L.*
C. muricata, *L.*
C. paniculata, *L.* Penally Marsh.
C. stellulata, *Good.*
C. glauca, *Scop.*
C. flava, *L.*
C. Œderi, *Ehrh.* Penally Marsh.
C. binervis, *Sm.* Castle Martin Corse.
C. paludosa, *Good.* Tenby, *Dr. Falconer.*

GRAMINEÆ.

Phalaris arundinacea, *L.*
Anthoxanthum odoratum, *L.*
Phleum pratense, *L.*
P. arenarium, *L.*
Alopecurus geniculatus, *L.*
A. pratensis, *L.*
Milium effusum, *L.* Near Tenby, *Dr. Falconer.*
Phragmites communis, *Trin.*
Psamma arenaria, *R. and S.*
Agrostis canina, *L.* Tenby, *Dr. Falconer.*
A. vulgaris, *Willd.*
A. alba, *L.*
Holcus lanatus, *L.*
H. mollis, *L.*
Aira cæspitosa, *L.*
A. flexuosa, *L.*
A. caryophyllea, *L.*
A. præcox, *L.* Near Tenby, *Dr. Falconer.*
Trisetum flavescens, *Beauv.*
Arrhenatherum avenaceum, *Beauv.*
Triodia decumbens, *Beauv.* Manorbier.
Molinia cærulea, *Mœnch.*
Poa pratensis, *L.*
P. trivialis, *L.*
P. compressa, *L.*
P. annua, *L.*
Glyceria aquatica, *Sm.*
G. fluitans, *R. Br.*
Sclerochloa loliacea, *Woods.*
S. procumbens, *Beauv.* Tenby, *Dr. Falconer.*
S. rigida, *Link.*
Briza media, *L.*
Catabrosa aquatica, *Presl.*
Cynosurus cristatus, *L.*
Dactylis glomerata, *L.*
Festuca sciuroides, *Roth.* Near Tenby.
F. ovina, *L.*
F. rubra, *L.*
F. gigantea, *Vill.* Near Tenby.
Bromus asper, *L.*
B. sterilis, *L.*
B. diandrus, *Curt.* Causeway Mill.
B. erectus, *Huds.* Tenby, *Dr. Falconer.*
Serrafalcus mollis, *Parl.*
S. commutatus, *Bab.*
Brachypodium sylvaticum, *R. and S.*
Triticum repens, *L.*
T. acutum, *De Cand.* Tenby and Saundersfoot.
T. junceum, *L.*
T. caninum, *Huds.*
Hordeum murinum, *L.*
Lolium perenne, *L.*
L. temulentum, *β. arvense*, *With.*

EQUISETACEÆ.

Equisetum arvense, *L.*
E. maximum, *Lam.*
E. limosum, *L.*
E. palustre, *L.*

FILICES.

Polypodium vulgare, *L.*
Lastrea Thelypteris, *Presl.* Penally Marsh.
L. Oreopteris, *Presl.* Thicket, below Fordy Green, near Gomfreston.
L. Filix-mas, *Presl.*
L. dilatata, *Presl.*
Polystichum angulare, *Newm.* Probably the *P. aculeatum* of Falconer.
Athyrium Filix-fœmina, *Roth.*
Asplenium Adiantum-nigrum, *L.*
A. Trichomanes, *L.*
A. marinum, *L.* Near Tenby.
A. Ruta-muraria, *L.*
Scolopendrium vulgare, *Sym.*
Ceterach officinarum, *Willd.*
Blechnum boreale, *Sw.*
Pteris aquilina, *L.*
Osmunda regalis, *L.*
Botrychium Lunaria, *Sw.* Gomfreston Marsh, *the Misses Smith.*

CHARACEÆ.

Chara vulgaris, *L.*
C. fragilis, *Desv.*

OFFICIAL REPORT ON THE PROGRESS AND CONDITION OF THE ROYAL GARDENS AT KEW, DURING THE YEAR 1862.

BY SIR WILLIAM J. HOOKER, K.H., LL.D., ETC.

As was anticipated, the number of visitors to the Royal Gardens last year exceeded that of any previous one, being 550,132, or 70,062 more than in 1861; an increase mainly due to the foreigners who came to see the International Exhibition or who held office there. The necessary arrangements having been made to meet the expected throng, there was no crowding; and the cases of improper conduct were fewer than ever, as remarked to me by the police constables.

Number on Sundays	267,935
Number on weekdays	282,197
Greatest monthly attendance (August)	133,321
Smallest monthly attendance (December)	1,543
Greatest weekday attendance (June 9)	12,479
Smallest weekday attendance (March 20)	4
Greatest Sunday attendance (August 24)	18,120
Smallest Sunday attendance (March 23)	10
Good Friday (April 18)	8,916

The completion of the grand centre of the Winter Garden, and the duties which the International Exhibition more especially entailed,

have caused the labours of the past year to be unusually heavy. On the other hand, their results have been beyond all proportion remunerative; for the Colonial collections of vegetable products, especially the superb series of timbers and ornamental woods presented to us from the International Exhibition, far more than repay the services we were enabled to render to that undertaking.

I. BOTANIC GARDEN.

No new buildings have been erected during the past year; but seven of our largest Tropical and Temperate houses have been rearranged, some of them twice, as follows :—

1. *The Architectural Hothouse* near the grand entrance, which, though fitted with a costly stove-heating apparatus, has hitherto been used as a greenhouse for colonial trees and shrubs. Its contents having been transferred to the Winter Garden, are replaced by our Aroids and other tropical large-leaved climbers, whose singular habit, magnificent foliage, and other peculiarities, not only render them eminently adapted to this house, but are such as to arrest the attention of visitors on entering the Gardens.

2. *The Old Orangery*, long condemned as utterly unsuited to the cultivation of plants, has also been cleared, and its contents transferred to the Winter Garden.

3. *The Palm-house.*—Here a large number of Palms and other plants of temperate climates, better suited to the Winter Garden, had long been accommodated, and had attained a great size. Their removal necessitated a complete rearrangement of all the other tubbed and potted plants, and occupied five months; it also gave an opportunity for disposing differently the plants in the wings, which are now placed in two parallel lines, with an intermediate central walk.

4. *The Ornamental Greenhouse*, No. 10, has been relieved of its larger inmates, especially the Australian Acacias, etc., which are now placed in the Winter Garden. Thus increased accommodation is gained for flowering-plants.

5. *The Stovehouses* Nos. 19 and 21, which formerly contained chiefly Orchids, and the Aroids, etc., now grouped in No. 1, have both been twice filled and emptied. They are eminently adapted to our yearly increasing collection of tender small Palms and Cycads, etc., from our East Indian possessions, and West Indian and West African colonies.

6. *The Collection of Bulbs* from the Cape of Good Hope, augmented during the past year by a magnificent donation from W. Wilson Saunders, Esq., F.R.S., has been accommodated in the pits built for rearing Chinchonas.

7. A large portion of the general collection of Orchids, which has been steadily increasing for the last two years, is temporarily deposited in No. 18, pending further alterations necessitated by the augmentation of flower-beds contemplated during the present year.

As regards the general condition and ornamental appearance of the shrubberies, walks, and flower-beds ; the cutting-up of the gravel paths by the trucks and waggons used in transporting plants, and the employment of our men in this transport, have much prevented the usual progress of improvement in these parts.

Important contributors of plants and seeds have been,—Mr. Gustav Mann, our collector in West Africa; Mr. Oldham, our collector in Japan; Dr. Lyall, R.N., in British Columbia: Mr. Schiller, of Hamburg (Orchids): and W. Wilson Saunders, Esq., whose magnificent gift of bulbs has been already noticed; also Mr. Hoey has sent us large collections of plants from Japan.

In my last two Reports, I described the assistance afforded by us in introducing Chinchona plants into our foreign possessions; namely, to India, where Mr. Markham's exertions have achieved remarkable success, and to Ceylon, and the West Indian colonies, by the Royal Gardens. The following is a concise statement of the results :—

	Plants.
On the Neilgherries,* under charge of Mr. M'Ivor	72,568
In the Sikkim Himalaya, under Dr. Anderson . .	2,000
In Ceylon, under Mr. Thwaites, about	3,000

The accounts from Jamaica, under Mr. Wilson, and Trinidad, under Mr. Crüger, are both very favourable.

II. ARBORETUM AND PLEASURE GROUNDS.

Winter Garden.—The most important work in this department is the completion of the grand centre (212 feet long, by 137 feet broad, and 60 feet high) from the designs of Mr. Decimus Burton, by which

* While this report is in the press, information has reached me from India to the effect that the number of Chinchona plants in cultivation in the Neilgherries alone, amounts to 117,706. [They amounted to 167,215 on the 1st of June.—Ed.]

the space between the two octagons built last year is filled. The area it encloses has been laid out in oblong beds, intersected by broad parallel paths. Under the loftiest part the trees are planted in straight lines, forming avenues of Araucarias, Palms, Tree-ferns, etc., while the side beds contain Rhododendrons, Acacias, Camellias, Magnolias, Myrtles, Banksias, etc. Such were the delays in the completion of this building, that it was with extreme difficulty the plants were housed before cold weather set in; their planting out in the beds, indeed, is still unfinished.

A very extensive belt of trees and shrubs is now planted, in order to screen the town of Brentford and the unsightly buildings connected with its new docks and railway terminus from the beautiful walk that skirts the grounds. To effect this, between five and six acres have been prepared and 8750 vigorous young trees and shrubs planted. Thanks to the care with which the plants in our nursery have been husbanded and increased, this work was accomplished without our making a single purchase. The excavation of the lake-bed having been carried far enough last year to allow of the construction of the conduit communicating with the Thames, the water was let in early last spring, but was afterwards drawn off again, as it was necessary to cart the gravel for the terrace and the interior of the Winter Garden. A considerable quantity still remains to be removed for the same purposes. The plantation in the Queen's Garden, and that on the mound at the end of the Syon House Avenue, have been greatly improved and are in a very flourishing state. Lodges have been erected at the Brentford and the Lion Gates, in anticipation of the Arboretum being thrown open to the public during the winter.

Nurseries.—The one which supplies our own grounds is well stocked with young and healthy plants; and that which provides trees and shrubs for the metropolitan parks is in an equally good condition.

III. SCIENTIFIC DEPARTMENT.

Museums.—In no previous year have the donations to these buildings been so numerous and valuable; they have chiefly been derived from the International Exhibition. Thanks to his Grace the Duke of Newcastle, Secretary of State for the Colonies, and to the general appreciation of our Museums by the respective governors and by the colonists themselves, almost the whole of the vegetable products of our more im-

portant dependencies have been transferred to the Royal Gardens. In many instances the collections were made and sent with a special view to this destination. It is impossible to exaggerate their general value. Those especially of Tasmania, of Victoria, and North, South, and West Australia, Queensland, Canada, Guiana, Natal, and Dominica, were formed at great labour and cost, under the immediate direction of men of scientific attainments and excellent practical knowledge, who have attached the proper names to every specimen, and added a vast amount of serviceable information on the uses, qualities, and abundance of the woods in their annexed reports. The specimens are of large size, selected from sound trees and cut with great judgment, partially polished, and often of uncommon beauty. Our acknowledgments have been tendered to the following commissioners and contributors :—

British Columbia	Dr. Lindley, F.R.S.
Vancouver Island	Hon. A. J. Langley.
British Guiana and Trinidad . .	Sir W. H. Holmes.
Cape of Good Hope	Rawson Rawson, Esq.
Natal	Mrs. Scott and W. C. Sargeant, Esq.
Mauritius	James Morris, Esq.
St. Helena	Sir E. H. Drummond Hay.
Bahamas	S. Harris, Esq.
New Brunswick	T. Daniel, Esq.
Queensland	M. H. Marsh, Esq., M.P.
Ceylon	E. Rawdon Power, Esq.
Victoria	Sir Redmond Barry.
Dominica	P. L. Simmonds, Esq.
Ionian Islands	H. Drummond Wolff, Esq.
Canada	B. Chamberlin, Esq.
Tasmania	F. Ducroz, Esq.
New South Wales	Sir D. Cooper, Bart.
Russia	G. Peterson, Esq.
Austria	Chev. de Schwartz.

As our existing Museums cannot accommodate the above fine collections of woods, the Board have under consideration how they can be most advantageously placed. With what we already possess, they form a very complete series of the known timbers of those countries. Other donations are, Fruits from Venezuela; Vegetable Oils and Varnishes from Messrs. G. and T. Wallis; Perfumes from Mr. Piesse; Preserved Fruits from Messrs. Fortnum and Mason; Box-wood prepared for engraving from Mr. R. J. Scott; and illustrations of the process of ma-

nufacturing toys by turnery in Leipsic, from Professor Reichenbach, jun. One of the most remarkable donations is that of Vegetable Substances illustrating the customs and food of the inhabitants of the ancient lake-dwellings of the prehistoric races of Switzerland, a highly curious collection, presented by Professor O. Heer, of Zurich. Also two valuable marble busts (by Woolner) have been presented to the Museum, one by Miss Henslow, of her late brother the Rev. Professor Henslow; the other is presented by Henry Christy, Esq., F.L.S.

HERBARIUM AND LIBRARY.

In consequence partly of the active exertions of the Fellows of the Horticultural Society, and the fine exhibition of rare plants and of European and American vegetable products which they instituted, an unusually large number of Plants have been sent to the Herbarium to be named; and there was an almost incessant demand for information from exhibitors in the International Exhibition, and others. No fewer than forty botanists have pursued their studies in the Herbarium during the past year, including many distinguished travellers and men of science, and others engaged in important botanical and pharmaceutical researches. The additions to the Herbarium have been very large, and include:—

1. The British Herbarium of the late William Borrer, Esq., F.L.S., which represents the rise and progress of the Botany of the British Isles through upwards of half a century, and is unquestionably the fullest and finest in existence. Presented by his widow.

2. The Australian Herbarium of the late Allan Cunningham, Colonial Botanist, formed during thirty years of exploratory voyages and journeys through Australia. It includes his New Zealand, Timor, and Norfolk Island Plants, together with all his botanical MSS. and journals; a most important contribution, presented by Robert Heward, Esq., F.L.S.

3. The unrivalled collection of British Seaweeds, formed during a long life devoted to that Order of plants, by Mrs. Griffiths, of Torquay. Presented by Miss Burdett Coutts.

Other Herbarium specimens have been received from thirty-five botanists and collectors. The chief are:—

1. Large collections, full of novelty, from the Cameroon Mountains and Gaboon River; Mr. G. Mann, Government Botanist.—2. Living-

stone's expedition, Plants and Drawings; Dr. Kirk and Dr. Meller.—3. Madagascar; Dr. Meller, when accompanying the Embassy to King Radama.—4. Algeria; M. Cosson, of Paris.—5. Abyssinia; M. Franqueville.—6. Aden and Soumali Country, drug and balsam-yielding Plants; Captain Playfair.—7. Upper Nile and Soudan; Consul Petherick.—8. Niger River; Dr. Bakie.—9. Loanda and Benguela; Dr. Welwitsch, including the *Welwitschia*, the most remarkable plant of modern times, of which specimens arrived in the same year from Dr. Welwitsch and Mr. Monteiro from Cape Negro, and from Mr. Baines, and Mr. Andersson from Waalvisch Bay, Damara Land.—10. Punjaub; Dr. Aitchieson.—11. N.W. Himalaya; Dr. Stuart.—Moulmeine; Rev. W. Parish.—12. Ceylon; G. H. K. Thwaites.—13. Australia; Dr. Mueller, Sir Stuart Donaldson, Mr. Hill, Mr. Moore, etc.—14. New Zealand; the late Dr. Sinclair, Dr. Haast, Mr. Travers, Dr. L. Lindsay.—15. Sandwich Islands; Dr. Hillebrand.—16. New Caledonia; Mr. Le Normand.—17. Fiji Islands; Mr. Storck.—18. British Columbia; Dr. Lyall.—19. Dominica; Dr. Imray.—20. Cuba; M. De Franqueville.—21. Trinidad; Mr. Crüger.—22. Panama; Mr. Sutton Hayes. Also various collections from the Universities, Botanical Gardens, etc., of St. Petersburg, Upsala, the Smithsonian Institute, etc. etc.

The books published in this Herbarium during the past year have been:—

1. The 'Genera Plantarum,' Part I., by G. Bentham and the Assistant Director.
2. The 'Botanical Magazine,' and
3. The 'Species Filicum,' by the Director.
4. A Memoir on *Welwitschia*, by the Assistant Director, with 14 plates, the expense of transferring which to stone was paid from the grant annually placed at the disposal of the Royal Society for the Promotion of Science.

Various botanical papers on the collections received, have been contributed to the Linnean Society by Mr. Bentham, by the Assistant Director, and Professor Oliver, the Librarian. The new publications commenced are, a Flora of all the Australian Colonies by Mr. Bentham, and a Manual of New Zealand Botany by the Assistant Director, both to be published by the Government of the respective Colonies. The distribution of duplicate named specimens has been very large, amount-

ing to upwards of 30,000, sent to public and private Herbaria and Museums; this is exclusive of the North American Boundary Line collections of Dr. Lyall, amounting to upwards of 3000, all named at Kew and distributed by himself, at the expense of the Admiralty.

In conclusion, I would here record our great obligations to the Secretaries of State for Colonial and Foreign Affairs, the Board of Trade, the First Lord of the Admiralty; and to the Peninsular and Oriental Steamship and other Companies for essential aid in the transit of cases of Plants, etc., free or at reduced rates.

ON *HYPERICUM LINEOLATUM.*

By J. G. Baker, Esq.

The following is a translation of the descriptions of *Hypericum perforatum* and *lineolatum* given in the third edition of Boreau's Flora, vol. ii. p. 123:—

"*H. lineolatum*, Jordan, Arch. Bill. p. 343.—Rootstock branched, subligneous, stem 1½ to 2 feet high, straight, branched at the summit, furnished with two prominent lines. Leaves oblong or oblong-oval, obtuse, almost equal at the base, sessile, almost amplexicaul, scattered over with large glandular translucid dots and tolerably numerous black glands. Panicle with erecto-patent branches, fastigiate at the top, and forming a corymb-like cluster. Pedicels shorter than the calyx. Sepals lanceolate, very acute, slightly denticulate at the apex, marked on the outside with black dots and scattered lines. Petals of a clear yellow, oblong-oval, charged on the edges with round glands, and on the back with black lines. Capsule bearing on the sides of the valves somewhat prominent, reddish, linear-oblong, oblique, glandular rugosities. Seeds brownish-black, linear-oblong, almost straight, finely celled.

"*H. perforatum*, L. Sp. 1105.—Rootstock firm, branched. Stem 1 to 2½ feet high, straight, branched, glabrous, winged with two prominent lines. Leaves sessile, oval-oblong, narrowed into an obtuse point, thickly covered with glandular translucid dots and few black glands. Panicle with open spreading branches, corymbose or pyramidal at the top. Pedicels longer than the calyx. Sepals lanceolate, gradually narrowed into an acute point, often dotted with black on the back. Petals yellow, obovate, slightly dotted at the edges, but not rayed with black. Capsule oval, bearing on the sides of the valves linear, elongated, reddish, glandular rugosities. Styles long, divergent, with red stigmas. Seeds oval-oblong, finely celled."

I have not seen authenticated specimens of the French *H. lineolatum*, but it is stated to be more common in some parts of Belgium than the

true *H. perforatum.* It is included, by Professor Van Heurck, in his first fasciculus of rare and critical Belgian plants, and a large bundle of Belgian specimens gathered by the Professor is now before me. A plant grows sparingly, in the neighbourhood of Thirsk, in similar situations to the true *H. perforatum*, with conspicuous black lines in the furrows of the outer surface of the petals, and with some of the lower leaves dotted very sparingly with pellucid points, which I cannot otherwise than identify with *lineolatum.* At the same time I cannot see that it is more than a variety or mere form of our common species. In a large bundle of our common *H. perforatum* in a fresh state, now before me, the length of the peduncles is very variable; in some of the specimens most of the flowers are sessile, or nearly so; in most of them the stalk of the flower, at the end of a branch, is shorter than the calyx; but the peduncles of most of the lateral flowers are longer than the calyx; and this is also the case with the Belgian and British examples of *lineolatum.* In none of my specimens does M. Boreau's character of "pedicels longer than the calyx" hold good, without exception. The leaves of *H. perforatum* are very variable in shape. In the specimens now before me the measurement of the fully-developed leaves of the main stem varies from three-quarters of an inch broad by rather more than an inch long to from three-eighths of an inch broad by an inch long; and in one of my dried specimens, from Aysgarth Force in Wensleydale, the leaves are fully an inch long by only a quarter of an inch broad. The shape of the sepals also varies somewhat, in concomitance with the shape of the leaves.

ON THE POSITION OF THE GENERA HYDROCOTYLE, OPA, COMMIA, AND BLASTUS IN THE NATURAL SYSTEM.

By Berthold Seemann, Ph.D., F.L.S.

I. Hydrocotyle, *Linn.*

The genus *Hydrocotyle*, though represented in Europe by two or three species and passed through the hands of innumerable local botanists, has as yet not been placed in its true position in the natural system. Every one regards it as a member of the Natural Order *Umbelliferæ*,

and yet how different is its very look from all the most typical *Umbelliferæ!* None of the other European *Umbelliferæ* (for the present I will not mention those of other countries) have genuine stipules and peltate leaves, and few such an imperfect umbel as *Hydrocotyle* has. The characters of the most typical *Umbelliferæ* the genus does not possess. Its fruit is didynamous, it is true, but the two carpels do not separate from the carpopod, nor are they vittate. To this must be added another highly important character. The æstivation of the corolla, though described by all botanists as imbricate, is nevertheless truly *valvate.* The unanimity with which this later point was insisted upon by all the works consulted, made me anxious to have my observations confirmed by others, and I am glad to be able to add that Messrs. Bennett, Carruthers, and Newbould, who saw a bud under very high microscopic power, were unanimous in declaring the æstivation truly valvate. *Hydrocotyle* is in fact no *Umbellifera* at all, but belongs to the same Order as *Hedera Helix*, especially that group which has peltate or palmate leaves and stipules.*

The distinctive characters assigned by authors to *Umbelliferæ* and *Araliaceæ* break down when applied to the whole of the two Orders as they now stand, and it will be necessary to search for new ones which shall interfere least with the true limits of these two most natural of Natural Orders. This can best be effected, I think, by relying upon the æstivation of the corolla for that purpose. Restrict the name *Umbelliferæ* to all plants having a truly imbricate or an involute æstivation, and that of *Araliaceæ* or *Hederaceæ* to all having a valvate or quincuncial one. *Horsfieldia*, a shrubby, spiny plant, having a truly valvate corolla, and until now retained in *Umbelliferæ*, has been regarded as weakening the character derivable from the æstivation; but with all due deference to the opinion of two eminent botanists who placed it there, I cannot regard *Horsfieldia* as a true *Umbellifera;* indeed, I have not yet been able to find any generic differences between it and *Echinopanax*. The latter, having the same habit, probably is a congener of *Horsfieldia;* and about its Natural Order there has never been a shadow of doubt, it being referred by Smith to *Panax* (under

* The pollen grains of *Hydrocotyle* are whitish, and very much resemble coffee-beans in shape, being smooth and convex on one side and flat on the other, with a longitudinal furrow. The pedicels of the flowers are constricted below the calyx, but apparently without any articulation at that point, nor is there a trace of a calyculus.

the name of *P. horridum*), and by Willdenow and Hooker to *Aralia* (under those of *A. occidentalis* and *A. erinacea*).

I have not yet gone over all the Umbelliferous genera suspected of a valvate corolla, but I shall do so before finally publishing a paper I have been preparing on the *Araliaceæ*, and for the present confine myself to transferring to *Araliaceæ*, *Hydrocotyle*, *Diplepsis*, *Pozoa*, *Astrotricha*, and *Horsfieldia*.

In their paper on *Araliaceæ*, Decaisne and Planchon* have stated the corolla of a few species of *Aralia* and *Panax* to be *imbricate*. They probably employed the term in a loose way, for in *Panax quinquefolium*, *P. trifolium*, *Aralia racemosa*, and the plants of which they are the generic type, the corolla is *quincuncial*, that is to say, of the five petals, the two external ones overlap two of the internal ones, and the fifth is overlapping on one edge, and overlapped on the other.

II. Opa, *Lour.*

The genus *Opa* has been referred to *Syzygium* of Gærtner by De Candolle, following up a hint thrown out by Willdenow, in his edition of the 'Flora Cochinchinensis.' Loureiro described two species, *Opa odorata* and *O. Metrosideros*, authentic specimens of both of which are preserved at the British Museum. *O. odorata* is a true *Syzygium* (*S. odoratum*, De Cand., *S. lucidum*, Gærtn.); and, as the genus *Syzygium* was published in 1788, and *Opa* in 1790, the name *Syzygium* enjoys the right of priority.

It is different with *Opa Meterosideros*, which De Candolle refers with a mark of doubt to *Syzygium*, but which is no *Myrtacea* at all. Both Loureiro's description and two authentic specimens prove it to be identical with *Rhaphiolepis Indica*, Lindl., and as *Rhaphiolepis* is the most recent name it will have to be suppressed.

Opa, Lour. Fl. Cochinch. excl. sp.—Rhaphiolepis, *Lindl. Bot. Reg. t.* 468.

1. *O. Meterosideros*, Lour. Fl. Cochinch. et Willd. p. 378, excl. syn. Rumph.—Rhaphiolepis Indica, *Lindl. Bot. Reg. t.* 468; *Bot. Mag. t.* 1726; *Benth. Fl. Hongkong. p.* 167. R. rubra, Phiostemon, *et* salicifolia, *Lindl. Coll. Bot. et Bot. Reg. t.* 652. Syzygium (?) Metrosideros, *De Cand. Prod.* iii. *p.* 261.—China and Cochinchina.

* 'Revue Horticole,' 1854.

2. *O. Japonica*, Seem.—Rhaphiolepis Japonica, *Sieb. et Zucc. Fl. Jap. t.* 85.—Japan and Bonin.

3. *O. integerrima*, Seem.—Rhaphiolepis integerrima, *Hook. et Arn. Bot. Beech. p.* 263.—Bonin.

4. *O. spiralis*, Seem.—Mespilus, *Blume.* Rhaphiolepis, *G. Don.*—Java.

5. *O. Mertensii*, Seem.—Rhaphiolepis, *Sieb. et Zucc. l. c.*—Japan.

III. Commia, *Lour.*

This genus has been correctly referred to *Euphorbiaceæ*, but even the latest writers on that Order, including Baillon (Étud. Euphorb., Paris, 1858), do not know what to make of it. Loureiro's two authentic specimens at the British Museum prove it to be *Excœcaria Agallocha*, a common seaside tree in the tropics of the Old World. The leaves are sometimes quite entire (the greater number are so in Loureiro's specimens), but they are more generally serrate. The apparent structural difference between *Commia* and *Excœcaria* resolves itself into errors of description on Loureiro's part.

IV. Blastus, *Lour.*

This genus, omitted by De Candolle, Endlicher, and Lindley, is a genuine *Melastomacea*, unfortunately also overlooked by Naudin. The authentic specimens at the British Museum show it to be allied to *Aplectrum*, Bl. non Nutt. (*Anplectrum*, A. Gray), but differing in habit, in having a dehiscent capsule, not a berry, and only four stamens. Loureiro describes only one species, *B. Cochinchinensis*, which is identical with Bentham's *Anplectrum parviflorum*, from Hongkong, Formosa, and Assam.

Blastus Cochinchinensis, Lour. Fl. Cochinch.; fruticosa; ramis teretibus, dichotomis; foliis longe petiolatis, elliptico-oblongis, longe acuminatis, basi acutis, integerrimis, 3-nerviis, utrinque ramulis pedicellis calycibusque minute lepidotis, supra demum glabris; cymis axillaribus, sessilibus, paucifloris; calycis tubo subgloboso, limbo 4-dentato; petalis lanceolatis; staminibus 4; capsula 4-valvi; seminibus numerosis, cuneatis, angulatis.—*Anplectrum parviflorum*, Benth. Fl. Hongk. p. 116. —Southern China (*Loureiro! in Mus. Brit.*); Hongkong (*Wright! in Herb. Hook.*), Formosa (*Wilford! in Herb. Hook.*), Assam (*Masters! in Herb. Hook.*).

Placed by Loureiro in Gynandria Tetrandria, probably on account of the way in which the anthers are buried in the ovary, a feature the genus shares with other *Melastomaceæ*.

ROSA HIBERNICA, Sm.

Mr. F. M. Webb states, in the 'Liverpool Naturalists' Scrap Book,' no. ii. p. 28, that he finds this Rose tolerably abundant at Great Meols, in Cheshire. It had previously been found by the late Mr. Borrer in Cumberland, by Professor Oliver in Northumberland, and Mr. J. G. Baker in North Yorkshire.

FUMARIA MEDIA, Lois.

Mr. F. M. Webb announces, in the Liverpool 'Naturalists' Scrap Book,' no. ii. p. 28, that a *Fumaria*, so named by Mr. J. G. Baker, was found by him close to Claughton village. From his description it seems to be the rampant form of *Fumaria officinalis*, which has occurred in several places. Much doubt attends the determination of the plant intended by Loiseleur. The name has been very variously used by authors, and seems now likely to be universally dropped, as only causing confusion, and conveying no certain information as to the plant meant. Mr. Webb's plant does not seem to be either a distinct "species, or variety, or hybrid," but only a state of *F. officinalis*.

PLANTS NOTICED AT HUNSTANTON, ON THE COAST OF NORFOLK.

**Ranunculus Drouetii*, **R. Baudotii*, *R. circinatus*, *Frankenia lævis*, **Lepigonum neglectum*, **Linum angustifolium*, **Statice caspia*, *Chenopodium botryoides*, *Suæda fruticosa*, **Triticum acutum*. All these, except the *Chenopodium*, were seen on July 13, 1863. A star is appended to the names of plants not recorded for the (11) North Ouse Subprovince by Mr. H. C. Watson, in the 'Supplement to the Cybele Britannica.'

A complete turf is formed over extensive flats by *Glaux maritima* or *Anagallis tenella*, each quite alone. *Honkeneja peploides* also covers

very extensive sands. The *Statice caspia* is so abundant in one place as nearly to cover the whole surface of probably a square of a hundred yards. It was coming into full flower on July 13, and its presence was manifested at a considerable distance by the mass of its flowers.—C. C. BABINGTON.

FUCUS FURCATUS, *Agardh*, A NEW BRITISH SEAWEED.

Professor Harvey and Mr. N. B. Ward discovered, in July last, *Fucus furcatus*, Agardh, on the west coast of Ireland, full particulars of which, and a plate, will be published in our Journal at an early date. This addition to our marine flora is the more important as the *Fucus* in question had hitherto been met with only at Unalashka (Behring Strait), and on the coast of Newfoundland.

NEW PUBLICATIONS.

Naturalists' Scrap Book for the Liverpool District. Parts I. to VI. 8vo.

We have received and read with pleasure the first six numbers of this unpretending journal, and we had best let its editors explain their object in their own words:—

"The title chosen for this publication suggests the objects for which it is issued, namely, to serve as a repository for new or interesting information relating to the natural history of Liverpool and its neighbourhood, and to form a medium of communication between our local naturalists.

"Facts, trifling in themselves, when brought together, form the basis on which alone the life-history of an animal or plant can be furnished."

The portion which has appeared proves, what we never doubted, that a popularly-written journal, although it contains many statements of only local interest, may nevertheless be totally devoid of the twaddle with which such periodicals are not unfrequently filled. This shows that the editors are men of sound judgment, and good naturalists, and that there are many readers and contributors as little inclined to accept nonsense and trivialities for science as are the editors. In order to save expense, this journal is not printed from type, but lithographed, and it is issued to the subscribers at almost exactly cost price. Each

number contains sixteen octavo pages of manuscript (three being about equal to one of ours in quantity), and in order to increase the amount of information afforded by it, each article is condensed as far as it conveniently can be; all irrelevant matter being omitted. As the object is Natural History generally, the larger part of the numbers naturally treat of zoology, but there is a considerable quantity of botany in each of them. The following remarks by a lady on the uses of Naturalists' Field Clubs is deserving of attention. Speaking of that established at Liverpool, she says:—

"I believe the purpose for which it was established was to excite an interest in Natural History generally, and to awaken a taste for the study of it, and this I am sure it has effected in the *botanical* department, the only branch about which I can speak.

"There are many ladies who, from love for flowers, have a great desire to know more about their history and structure, and yet are deterred from the study of botany, because it appears so dry; they have no one to help them over the first difficulties, and no lectures are accessible to them, not even are the botanic gardens laid out so as to give them the help they want. Now all these difficulties were felt in Liverpool as much as elsewhere, until the Field Club was established, but in a few months after that they were all removed. When the first winter approached, Mr. Higgins proposed country walks, for the purpose of collecting and studying Cryptogamic plants, when he could give any instruction required, provided only that those who joined would really work. About a dozen ladies and gentlemen at once gave in their names, and throughout that winter not one tolerably fine Saturday passed without their meeting, learning much, and bringing home many new thoughts and facts.

"Mr. Higgins was assisted by several good botanists, so when the members increased there were still teachers sufficient.

"After that, Dr. Collingwood gave a course of lectures on structural botany, and Mr. Marrat and Mr. Fisher on practical botany, all of which were well attended, by those who were only too glad to be thus helped.

"At once, then, two great wants were supplied; acquaintance with botanists and opportunities for obtaining instruction (and immediately, by appointment of present curator, the botanic gardens became botanical). Now these advantages have been derived directly from the Field Club.

"The lady workers well know the encouragement given by the excursion prizes, but I merely mention them now, to say that all who have hitherto received prizes have derived their knowledge of botany entirely from the advantages given them by the Field Club.

"Each year new candidates are arising, and the impulse given by this Society instead of diminishing is regularly increasing; and the taste for the study of Natural History will continue to increase as long as similar means are employed.

"C. Grundy.

"*Upper Parliament Street.*"

In the third and following numbers, Mr. F. P. Marrat gives a very full list of the Algæ found in the Liverpool district. We recommend its perusal to botanists interested in the minute geographical distribution of these interesting plants. It seems drawn up with much care. In the same number Mr. H. S. Fisher states the opinion, that the blue *Viola odorata* is not a native of the district of Liverpool, but that it is replaced by the white form of that species, the *V. alba* of Continental botanists apparently. This white Violet seems to be common in those parts of Lancashire and Cheshire.

We might notice some other matters contained in this unpretending work, but perhaps the above-mentioned are the most interesting, except those which will be found mentioned separately in our pages.

We sincerely trust that this attempt to spread an interest in Natural History in Liverpool will go on and prosper.

Précis des principales Herborisations faites en Maine-et-Loire en 1862, *suivi de dissertations critiques sur plusieurs espèces de plantes.* By A. Boreau. Angers, 1863.

In this small pamphlet, Professor Boreau gives us an account of the principal excursions which he has made with his pupils during the collecting season of 1862, from Angers as a centre; and this is followed by a number of notes and observations on critical species and plants new to the flora of Central France. One of the most interesting additions is *Rosa baltica* of Roth, the *R. lucida* of Koch's Synopsis, known previously upon the shores of Northern Germany, and now detected upon those of the department of the Lower Loire. M. Boreau denies the identity of the plant with the North American *R. lucida*. It belongs to the group in which the prickles pass gradually into setaceous aciculi, and is, upon the whole, of our species, nearest to *R. spinosissima*; but the leaves are hairy upon the nerves beneath, the flowers deep red and grouped in from threes to sixes together, the peduncles and calyx-tubes glandular, and the calyx-segments deciduous. A plant of *Primula variabilis*, Goupil, brought from a wood near Angers, was planted in the Botanic Garden, and the seeds which it produced were sown in due course. Amongst the progeny were not only coloured-flowered forms, resembling the parent plant, but both true Primroses and Cows-

lips with coloured flowers also; the state of the case being doubtless, as suggested, that natural cross-breeding with other *Primulæ* grown in the garden had occurred. M. Boreau is quite prepared to admit the hybrid origin of this *P. variabilis*, which is, it cannot be doubted, identical with our common British Oxlip, the plant which was called *P. elatior* by English authors up to a comparatively recent date. It is tolerably plentiful, he says, in some of the departments of Central France, and is doubtless, as Goupil attempts to show, the original stock from which many of the *Primulæ* grown in gardens have been derived. As a specimen of our author's critical notes, we extract that which relates to the Linnæan *Tormentilla reptans*.

"This is a critical plant, with which authors have confounded several forms, of which the true characters are far from being well-defined, and these we will attempt to elucidate:—

"1. *Potentilla procumbens*, Sibth.—Linnæus having indicated his *Tormentilla reptans* only in England, we may with confidence refer to it as a synonym the *P. procumbens*, Sibth. Oxon. 162. This plant, according to the English botanists, has elongated stems, spreading, but not rooting, covered, as is the whole plant, and especially the under side of the leaves, with adpressed tolerably long hairs, which appear silky on the young shoots. The leaves have stalks of a moderate length, and from three to five obovate leaflets, which are inciso-dentate, with teeth pointing forward. The stipules are lanceolate, and either entire or lobed, and the solitary peduncles surpass the leaves. The sepals are hairy and ovate, the outer ones longer, and ovate-lanceolate, the petals obcordate, moderately large, in colour golden-yellow, and the carpels are rugose. This plant, of which I have received specimens from Yorkshire, is doubtless also the *P. decumbens*, Fries, Novit. Fl. Suec. 165, which, according to that author, is never rampant, and to which cannot be preserved the unfit name which Linnæus has given it. Lehmann (Index Hort. Hamb. 1849, No. 18, and Pugillus nonus, p. 20) described under the name of *P. italica*, quoting with doubt, as a synonym, *T. reptans*, Bert. Fl. Ital., a Tuscan plant, which, he says, differs from *procumbens* by its bright green colour, stems never rooting, oblong-obovate leaflets, with silvery hairs and deep forward-pointing, not spreading teeth. These characters belong exactly to the English *P. procumbens*. We may conclude safely that Lehmann's *P. nemoralis* differs from the English plant. The *P. procumbens* which I have received from Piedmont, in fact, much resembles the English plant, though the flowers are smaller, and this is also the case with the German plant of Reichenbach's sets of specimens.

"2. *P. nemoralis*, Nestl. Monog. p. 65 (for the greater part). *P. Neumayeriana*, Tratt. Ros. iv. p. 75. *P. procumbens*, Koch, Syn. ed. 2, p. 239, and Auct. excl. syn. Sibth. and Linn.—Our plant differs from the English species by its shorter, less abundant, and much less silky hairs, by its long creeping stems, which take root in the autumn, the steam-leaves mostly with three mode-

rately small obovate or even roundish leaflets with shallow teeth, smaller flowers with either four or five petals on the same plant, and striated carpels. But if this last character is available to distinguish these plants from *P. reptans*, Linn., it has but slight value as a specific distinction in the plants of the *Tormentilla* group, all of which have the carpels formed in the same manner, pale and smooth carpels occurring only before the seeds are ripe or when they are abortive. I refer to this species the *T. reptans*, Lejeune! Fl. de Spa, p. 236; that of Bastard! Suppl. Fl. M. and L. p. 10; that of Lloyd, Fl. Loire-Infér. p. 82; and that of Thomas! from Belpe, near Berne, a station quoted by Koch for his *P. procumbens*.

"3. *P. mixta*, Nolte, in Reich. Herb. Norm. n. 1743; Koch, Syn. ed. 2, p. 239; Boreau, Fl. Cent. ed. 2, n. 636. *P. procumbens*, Boreau, Fl. Cent. ed. 2, n. 790. *P. nemoralis*, Lehm. Monog. Pot. p. 147, t. 13.—This plant, which does not appear to me to be a distinct species, differs from the preceding only by its more robust proportions, its stem-leaves more frequently quinate with obovate leaflets, in shape more inclining to oblong than to roundish. The mode of propagation is just the same, and the carpels do not seem different. It appears to me therefore that this is only a form caused by a damper place of growth, our plant growing habitually in somewhat shaded places. It is not then surprising that Lange says that the seeds of *P. mixta* have produced *P. nemoralis*. It is not necessary to explain this by the hypothesis of hybridity, and to make of *P. mixta P. procumbenti-reptans*, Lehm., for, if as I believe, the true *P. procumbens*, Sibth., does not occur with us, it would be difficult to understand how it could form a hybrid with *P. reptans*.

"4. *P. Salisii*, Boreau. *P. nemoralis*, De Salis. *Tormentilla reptans*, var. *humilis*, Bertol. Fl. Ital. v. p. 285.—This differs from the preceding by the slenderness of all its parts, except the root, which is woody and elongated. The stalked leaves have mostly five obovate leaflets, which, even in luxuriant plants are still very small. The stem is not rampant in dry and elevated places, but becomes prostrate and roots at the nodes in looser and cooler soils. If the specimens gathered by M. Revelière belong to the same, the flowers are much smaller than in the preceding, and the petals are entire. It grows amongst the mountains of Corsica."

BOTANICAL NEWS.

The issue of Syme's 'English Botany' is steadily progressing, and we have now before us the first volume (elegantly bound) of this great work, containing coloured plates and descriptions of all the *Ranunculaceæ*, *Berberideæ*, *Nymphæaceæ*, *Papaveraceæ*, and *Cruciferæ* indigenous to Great Britain, with charming popular accounts of the folk-lore, uses, history, etc., of these plants, from the pen of Mrs. Lankester.

M. J. Gay has been to the south-west of France after *Isoëtes Boryana*, and has found two new stations of this plant in addition to the one previously known in the country.

Dr. Schweinfurth is preparing for the botanical exploration of Egypt, Nubia, the Upper Nile, and the coast of the Red Sea; and begs us to state that he would be glad to receive any hints and suggestions with which those interested in the vegetation of those countries may favour him, and that he is willing to procure any plants or information of special interest to which his attention may be directed. Communications should be directed to Dr. Schweinfurth, 58, Friederichsstrasse, Berlin. We wish the explorations might be extended to the snow-capped Kilimanjaro and Kenia, where probably more novelties are to be found than in any of the districts above mentioned.

Mr. Cross, favourably known in his connection with the introduction of Chinchonas into India, and lately engaged on the eastern side of Chimborazo in collecting ornamental plants for Messrs. Veitch, has, at the request of the India Office, started for Popayan and Bogotá, to procure seeds of the Pitaya and other valuable New Granadian bark-trees for the Government plantation in India.

With regard to several discrepancies observable in the dates occurring in the memoir of Augustin-Pyramus De Candolle (*supra*, pp. 107–120), M. Alphonse De Candolle writes to us:—"Tout en relevant une erreur singulière de moi, dans l'article bienveillant sur mon père, en 'Journal of Botany,' vous en commettez une autre, sur laquelle il vaudrait la peine de faire un erratum. Aug.-Pyr. De Candolle est mort le 9 Septembre 1841, et non le 5 Septembre 1851. Je l'avais bien indiqué en tête des mémoires. L'inexactitude singulière qui s'est glissée à la fin (25 Sept. au lieu de 9) est venue de ce que le 25 Septembre est pour moi une autre date fatale, celle de la mort de mon frère, de sorte qu'en rédigeant j'ai mis un jour pour l'autre."

On the 15th of April died Professor Ch. H. B. A. Moquin-Tandon, of Paris, Member of the Institute. He was a pupil of Dunal at Montpellier, and will be remembered principally by his 'Elements of Tetratology,' published in 1841, when he was Professor of Botany and Director of the Gardens at Toulouse; and by his synopsis of the *Phytolaccaceæ*, *Salsolaceæ*, *Basellaceæ*, and *Amarantaceæ*, contributed to De Candolle's 'Prodromus.' We have also to announce the death of Professor G. B. Amici, who died on the 10th of April last at Modena, where he had been born on the 25th of March, 1786. His name will always be honourably associated with the advancement of microscopy.

Mr. Maximowicz, author of the 'Flora Amurensis,' dispatched by the Russian Government to Japan for the purpose of investigating its vegetation, has not been able to get permission from the Japanese authorities to travel in the interior; but by employing native agency, he has succeeded in bringing together 1700 species of plants,—about the same number as that enumerated by Mr. Black in the tenth volume of the 'Bonplandia,'—and a fine set of drawings illustrative of the vegetable productions of the country.

Dried Plants for Sale.—Professor von Heldreich, of Athens, has issued a prospectus of his Herbarium Græcum Normale, which may be had on applying to Mr. J. G. Baker, of Thirsk, Yorkshire. The herbarium in question consists of about 800 of the more interesting plants of Greece, offered at the rate of 20*s*. the century for the set, 25*s*. if particular species be selected, and carriage at the charge of the purchaser.

Tab. 70

Salm Dyck, del. Fitch, lith.

Vincent Brooks, Imp.

ON *MAMMILLARIA SCHEERII*, *Mühlenpf.*, A RARE MEXICAN CACTUS.

By Berthold Seemann, Ph.D., F.L.S.

(Plate X.)

A few years ago Prince Salm-Dyck gave me for publication the drawing of a rare *Mammillaria* which had been named in honour of his friend Mr. Frederick Scheer, of Northfleet. The *Mammillaria* had flowered in the Prince's gardens, and as it has long since disappeared from our horticultural establishments, I now fulfil the request of the eminent botanist, too long deferred, in giving a coloured plate of this Cactus.

Mammillaria Scheerii was received in 1845 from Chihuahua, one of the northern states of Mexico, where it had been discovered with many other singular and beautiful *Cacteæ* by John Potts, Esq., the proprietor of the Mint of that state. In 1847, Dr. Mühlenpfordt, of Hanover, gave in the Berlin 'Gartenzeitung' a description and a plate of it; but the specimen figured was not in flower, so that our Plate is the first representation of the perfect plant.

Our *Mammillaria* was also met with in Emory's Mexican Boundary Survey, and is enumerated in Dr. Engelmann's valuable work on the *Cacteæ* collected during that expedition, where also a variety *β* (?) *valida* is mentioned. A few additional particulars about the plant are given by Mr. Scheer in my 'Botany of the Voyage of H.M.S. Herald,' where also the loss of the plant in our gardens is announced. The *Mammillaria* belongs to the section *Aulacothele*, Salm-Dyck, and Dr. Engelmann's subgenus *Coryphantha*, and is closely allied to *M. Salm-Dyckiana*, Scheer. Dr. Engelmann calls it a stately plant, by far the largest of northern *Mammillariæ*, and continues:—"Largest specimens before me are 7 inches high and 5 inches in diameter without the spines." The plant represented in our plate is therefore not fully developed in size. Indeed, I have seen garden specimens nearly coming up to the measurement given by the last-named author—one of the few who has not deserted the study of *Cacteæ* when that singular tribe of plants ceased to be fashionable.

Mammillaria *Scheerii;* robusta, magnimamma, globosa, ad basin prolifera, arillis latis tomentosis, mammillis glaucescentibus remotis

magnis, latitudine fere duplo longioribus, subprismaticis, fasci superiore profunde sulcata quasi biloba, sulco pubescente una vel plurimis glandulis munito, spinis validis e mammillarum apice nascentibus, citrinis v. sæpe albescentibus, dein luteis v. rubris, brunneo- vel nigro-sphacelatis, interioribus 8 parum reflexis, centrali uno longissimo robustissimo recto, bacca elongata (2 poll. longa) pallide lutea.

Mammillaria Scheerii, Mühlenpf. in Otto and Dietrich's Allg. Gartenzeitung, 1847, p. 97, cum icon.; Salm-Dyck, Cact. Hort. Dyck. p. 133; Scheer, in Seem. Bot. Herald, p. 289; Engelmann, in Emory's Boundary Survey (Cacteæ), p. 10.—Tab. nostr. n. X.

Geog. Distr. Around Chihuahua (*Potts !*), where it grows in red sandy loam; sandy ridges in the valley of the Rio Grande, from El Pasco to the Cañon; also at Eagle Spring and on prairies at the head of the Limpia (*Charles Wright*).

Explanation of Plate X.

Representing *Mammillaria Scheerii*, from a living plant formerly in the garden of the Prince of Salm-Dyck.—Fig. 1. A mamma. 2. Diagram, showing the disposition of the spines. 3. Longitudinal section of a flower. Fig. 1, slightly magnified.

ON A YORKSHIRE GALIUM ALLIED TO *G. ERECTUM*, *Huds.*

By J. G. Baker, Esq.

I have found this summer a *Galium* allied to *G. Mollugo* and *erectum*, especially to the latter, but which presents points of difference which appear to be noteworthy. I obtained it near a farmhouse, called Cleves, four miles east of Thirsk, upon the borders of a steeply sloping cornfield, where not long ago was a bank of brake, and bramble, and furze, the elevation of the locality being about 500 feet above the sea; and Gormire, the only lake, if lake it may be called, of North-East Yorkshire, being not above 100 yards distant.

The following are the characters of this plant:—The stems are three feet long, quadrangular, slightly thickened at the nodes, smooth throughout or somewhat hairy below, prostrate, and rooting at the base, spreading, or loosely ascending above, with numerous spreading branches from the lower part, so that the stems form a tufted

and entangled mass. Leaves on the primary stem seven or eight in a whorl, spreading at right angles from the stem, or reflexed. Well-developed leaves of the primary stem about a line broad, the broadest part being about two-thirds of the distance from the base to the apex, narrowed gradually from this towards the base, and slightly also towards the mucronate apex, in colour grass-green, the edges rough with forward-pointing prickles, the midrib opaque, or in the younger leaves translucent. Branches of the stem varying from erecto-patent to divergent at right angles, in luxuriant plants even the lower ones producing flowers, the separate panicles narrowly pyramidal and not numerously flowered, and the whorls of bracts of the upper branches often half as long as the peduncles they subtend. Lobes of the corolla spreading or reflexed, in colour almost pure white or slightly cream-coloured, or tinged with pink, broadly lanceolate, with an apiculus, in well-developed flowers one-sixteenth of an inch broad by one-eighth deep. Styles varying much in adhesion, free to the base, or united up to the middle in the same plant. Fruit-pedicels always erecto-patent, the angle not exceeding forty-five degrees, the pedicel two to four times as long as the fully matured fruit. Fruits oval, beautifully shagreened under a lens, but smooth to the touch.

G. erectum is a plant I have never seen growing, but, judging from the descriptions and a good series of dried specimens, it has slender erect stems one to two feet high, branched but little from their lower part, the lower branches of the panicle all placed above the middle of the stem, comparatively short and but slightly leafy, and not spreading at an angle of more than forty-five degrees. In the Cleves plant the stems are longer and more robust, spreading vaguely or at most loosely ascending, with such an abundance of long leafy branches from their lower part that the stems form a tangled closely-interlacing mass. The long leafy branches, which spring at a right angle from the lower part of the stem, often bear small panicles of flowers, so that the main panicle is much more diffused over the whole plant than in *erectum*, and remarkably mixed up amongst the leaves. In all my specimens of genuine *erectum* the leaves are erecto-patent, and so thick that, as the descriptions usually insist, the midrib is opaque. In the Cleves plant the leaves are as in *Mollugo*, either spreading or reflexed, and the midrib, especially in the young leaves, is translucent. In the shape of the leaves, the direction of the fruit-pedicels, and characters of the

flowers and fruit, I do not find any appreciable difference between the two.

In *G. Mollugo* the habit of growth is similar to that of this plant, but in favourable situations *Mollugo* has stems five or six feet in height, intertwined amongst the shrubs that support them, and rising to the summit of the hedgerows, robust, and dark purple when exposed, with a very ample and many-flowered panicle. The leaves are half as broad again as in genuine *G. erectum* and the Cleves plant, both absolutely and in proportion to their length, so broad that when spread out upon a plane there is but little interval between their lower halves. They are obovate-lanceolate in shape, narrowed below more suddenly than in *G. erectum*, less prickly at the edges, and thinner in texture, so that upon holding them up to the light the midrib is often translucent, and the lateral venation also perceptible. In normal *G. Mollugo* also the pedicel of the mature fruit is not more than twice its length, and spreads out at about a right angle, or is even somewhat deflexed; but in shade the pedicel is sometimes erecto-patent, and four times as long as the fruit. The panicle is much more numerously flowered and more wide-spreading than in *G. erectum*, but the separate flowers are conspicuously smaller and with narrower corolla-lobes. Between the Cleves plant and *G. Mollugo* there is at least a difference of a fortnight in flowering-time, the first fruits of the Cleves plant having begun to change colour before the first buds of *G. Mollugo* expand.

Our common *G. Mollugo* is the *G. elatum* of Thuillier, and there are at least four Continental species which come between this and *G. erectum*. *G. dumetorum*, Jordan, is described as having stems two to four feet long, prostrate and rooting at the base, afterwards loosely ascending, moderately thin, oblong or linear, veiny, leaves eight in a whorl, an ample subpyramidal panicle with erecto-patent upper branches, the lower branches elongated and spreading from the stem at a right angle, pedicels twice as long as the ovaries, a small whitish corolla with lanceolate lobes and a small brown slightly rugose fruit. With this, judging it from the description alone, I was inclined to think that the Cleves plant agreed best; but, upon submitting specimens to Professor Boreau, he considered that they were not identical. Of the other three plants to which allusion has just been made, *G. album*, Lam., has diffuse or procumbent tufted stems much shorter than in *G. Mollugo*, opaque, oblong-obovate leaves, a panicle with erect or slightly-

spreading branches, and erecto-patent fruit-pedicels; *G. viridulum*, Jordan, has diffuse spreading or deflexed stems, subpellucid linear-oblong leaves, a many-flowered panicle with spreading or deflexed lower branches, and very small flowers; and *G. rigidum*, Vill., has erect stems with numerous sterile branches below, linear-oblong opaque leaves, often spreading or deflexed, a panicle with erecto-patent upper and spreading lower branches, looser than in *G. erectum* and with shorter pedicels.

This will show how closely the extremes of the series are linked together by intermediate stages of gradation. Professor Babington suggests that the Cleves plant may be *G. album*, Vill., a plant usually quoted under *G. erectum*, but described as having reflexed leaves. It is evidently not the plant of Lamarck, who has the right of priority over the name. If E. B. 1673, "*G. Mollugo*," be really *G. elatum* of Thuillier, it cannot be considered as representing the plant satisfactorily, for, as already pointed out in this, the panicle is wide-spreading and very numerously flowered, the separate corolla-lobes being conspicuously smaller and narrower than in *erectum*, and not so pure a white. The 'English Botany' description assigns to *erectum* weak and flaccid stems, which is not the case with the genuine plant. There is a characteristic figure of a panicle of *G. elatum*, and also of the *insubricum* variety or subspecies, in Reichenbach's 'Icones Floræ Germanicæ,' vol. xvii., but that given under the name of "*Mollugo*" represents one of the plants intermediate between this and *erectum*. The plant given under this latter name has reflexed leaves on the lower part of the stem, and a few- (not more than two-dozen-) flowered panicle with erecto-patent branches.

TRICHOMANES RADICANS.

I have just been informed by Mr. Walter Gast, of Glasgow, that this rare Fern has been recently found in the northern half of the Isle of Arran, in Scotland, by Mr. George Combe, of Glasgow. He has sent a small specimen to me which is very like that found by Dr. Richardson in Yorkshire; it is clearly the true plant. The cells are interesting, being irregular in shape, but mostly oblong, and have very broad

interstices. Professor Gulliver's attention should be directed to them for comparison with those of *Hymenophyllum*, recently described by him in the 'Annals of Natural History.' C. C. Babington.

September 4, 1863.

COMPARISON OF THE LEAF-CELLS IN THE BRITISH HYMENOPHYLLEÆ.

By George Gulliver, F.R.S.,

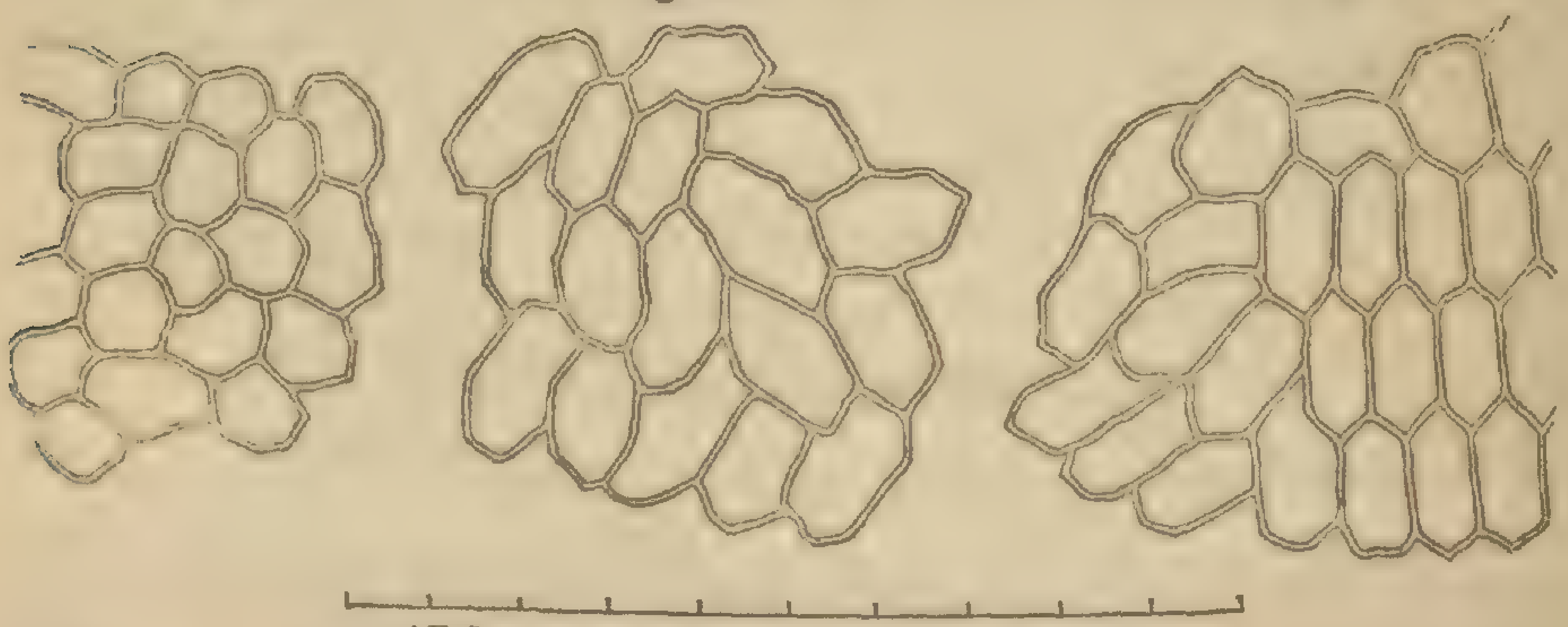
Professor of Anatomy and Physiology to the Royal College of Surgeons.

Responding to the suggestion of Professor Babington, I have prepared the following notes on the leaf-cells of the British Hymenophylleæ. Having been provided, through the courtesy of Mr. F. Clowes and Mr. N. B. Ward, with good specimens of each of these plants, I have made all the sketches anew, to the same scale of $\frac{1}{500}$ths of an inch, instead of copying two of them from my paper in the 'Annals of Natural History' of August last.

Hymenophyllum Tunbridgense, Sm. Leaf-cells nearly round, with an average diameter of $\frac{1}{571}$ of an inch, and forming a sphærenchyma.

H. Wilsoni, Hook. Leaf-cells larger and more elongated than those of *H. Tunbridgense*, and forming an ovenchyma. Their average long diameter $\frac{1}{308}$, and their short diameter $\frac{1}{615}$ of an inch.

Fig. 1. Fig. 2. Fig. 3.



All drawn to the scale of $\frac{1}{500}$ths of an inch.

Fig. 1. Outlines of the leaf-cells of *Hymenophyllum Tunbridgense*, Sm.
Fig. 2. Ditto ditto of *H. Wilsoni*, Hook.
Fig. 3. Ditto ditto of *Trichomanes radicans*, Sw.

Trichomanes radicans, Sw. Leaf-cells forming an ovenchyma, and but slightly smaller than those of *Hymenophyllum Wilsoni*.

Thus, while *H. Tunbridgense* is easily distinguishable by the leaf-cells from the other two plants, there is scarcely sufficient difference between the cells in *H. Wilsoni* and *Trichomanes radicans* to afford a diagnosis.

Besides the difference of the leaf-cells in the two species of *Hymenophyllum*, I may add that the tissue-cells of the involucres afford an equally good diagnostic between these two plants; for these cells are much larger in *H. Wilsoni* than in *H. Tunbridgense*.

Edenbridge, September 15, 1863.

TITHYMALUS BRAUNI, A NEW EUPHORBIACEA FROM ABYSSINIA.

Tithymalus Brauni (n. sp., habitu similis *Tith. Chilensi*, K. G.); T. radice crassa, lignosa, simplici; caudice valde incrassato, phyllopodiis processiformibus; ramis crassis, brevibus; umbellis radiis binis, foliosis; foliis glaucis, sessilibus, semiamplexicaulibus, ovato-oblongis, acutiusculis, mucronatis, floralibus conformibus; involucris pedunculatis, margine fimbriato-laciniatis, glandulis 1–3-appendiculatis; appendicibus erectis, luteis, ochream 1½–2 millim. longam referentibus; capsula glaberrima, coccis globosis; semine trigono, basi obtuso, apice acuto, grosse tuberculato.

Hab. in Abyssinia, 3300′–3500′ s. m. s. prope Gölleb, 25 Aug. 1854, leg. Schimper.

SCHWEINFURTH.

ON TWO FORMS OF PLANTS GROWING UNDER THE SAME CONDITIONS.

By Dr. John Edward Gray, F.R.S.

Some time ago I described a purple variety of *Anemone nemorosa* (Ann. Nat. Hist. 3rd ser. vii. p. 422), which grew in the same wood near to, but generally in distinct tufts from, the normal white form. This year, at Watfield, I saw the two forms intermingled in the same tufts,

the purple variety being distinctly marked by its darker foliage and narrower petals, as well as by the colour of the flower.

The flower of *Primula vulgaris* varies also considerably in colour, even in plants which grow on the same soil, and in the same position. In Pembrokeshire, especially near Broadhaven, the prevailing colour is pale lilac, so that to ask for a yellow ribbon as primrose-coloured would be a misnomer. Specimens of both varieties may be found growing on the same stone wall (which in this districts take the place of hedges), sometimes so close together as to appear almost as if they arose from the same root. Some specimens may occasionally be seen with nearly white flowers.

Occasionally a beautiful pink variety of *Oxalis Acetosella* may be found among the usual white form. Dillenius, in his edition of Ray's 'Synopsis,' records it as var. "flore purpureo," and on the authority of Dr. Richardson, one of the most enlightened naturalists and intelligent observers of his age, describes it as "a less plant than the common, and flowers later."

I have lately observed in the lane leading from Kew to the "Black Horse," at East Sheen, large quantities of *Lamium album* of the usual colour, but in certain beds of it, especially in one bed near Hope Cottage, there are many plants which have rose-coloured flowers, the outside of the upper lip being darkest in colour.

On the bank of the river, near Kew, there grow two forms of *Anthriscus sylvestris*, which are very distinct from one another in size and external appearance, but like the white Dead-nettle, they grow side by side in the same bed, and there is no apparent reason for the difference in size and colour, either in the soil, exposure, or situation of the plants. The one is a large strong plant with green foliage and large white flowers, and with a thick green stem with large angular projections on it. The other is a slender straggling plant, with the leaves far apart, small flowers, and stem not thicker than a crowquill, cylindrical and with numerous equal ridges. The stem and foliage are generally purple or blackish, rarely dark-green. These two plants, where extreme forms are examined, are so distinct that I am surprised they have not been described as distinct species in some of the Continental Floras; but I do not find them noticed in either British or foreign writers.

This plant is remarkable among the Umbelliferæ for having some small scales or *setulæ* at the base of the fruit, which, but for their posi-

tion, look remarkably like a calyx. These seem to have been generally overlooked by draughtsmen. In the 'English Botany' figure, which is not strictly characteristic of either variety, they are entirely omitted. I examined the original drawing of this plate by James Sowerby, which, with the whole series made for 'English Botany,' is now in the British Museum. I found that the careful artist had correctly given the calyx-like appendices at the base of the fruit; but Sir James Edward Smith, to whom the drawings were submitted for approval before being engraved, has corrected (!) the drawing, because, as he writes, they are "too like a calyx." Sir James, knowing that the fruit in Umbelliferæ is inferior, at once discarded Sowerby's "calyx," thus making his generalization or preconceived theory overturn the observed fact of the other, a proceeding too common amongst a certain class of naturalists.

ON THE ORIGIN OF HERBARIA.

By Ernst H. T. Meyer.*

As plants were dried from time immemorial for therapeutical purposes, it is probable that some of the early officinal collectors spread out either the whole or parts of some of these plants, and dried them between the leaves of a book or sheets of paper, as we do for our herbaria. This method of preserving plants, practised even by boys in the present day, becomes interesting when we inquire into its earliest use as an auxiliary to science,—but an auxiliary which even now is of more importance than the extensive botanical gardens of our day; for herbaria are the foundations of all published Floras, even those of Europe, but especially those of remote countries, the plants of some of which we only know by the dried collections brought from them. But as far as I am aware, no historical account of the application of this method of preserving plants for scientific purposes has been written. The herbarium is evidently one of those things which, from their universal and daily use, are overlooked, as regards their origin and history, by those em-

* We publish this translation from the last volume of the learned, though unfortunately unfinished 'Geschichte der Botanik' of the lamented Professor Meyer, as an introduction to an account of the older Herbaria preserved in the different public collections of Great Britain, which we hope to lay before our readers in an early number.—Ed.

ploying them. This indeed was my case until lately. An intelligent inquirer, who was preparing a paper on this subject, asked me who formed the earliest herbaria? where were the first records about such things to be found? and who first published anything on the drying of plants? I was the more struck by these questions, from the very little I knew about them. I gradually however remembered some facts relating to the early history of herbaria, and continuing my inquiries, I ascertained several others, which I shall now give, as a commencement, which I trust will be added to by others.

We must first notice that the word 'herbarium,' when used by the older authors, had a very different meaning from that which we now attach to it. To them it meant a book of plants, especially one illustrated with figures. Thus, we often read in Tournefort and later writers of the Herbarium of Fuchs, meaning his 'Historia Stirpium,' the Herbarium of Mattioli, that is, his Commentary on Dioscorides, and the like. The name 'herbarium vivum' was introduced in order to distinguish what we now mean by 'herbarium' from these books; but even this did not prevent ambiguity. Emanuel Koenig, among others, who in his 'Regnum Vegetabile,' Basle, 1708, writes a long chapter "De collectione plantarum vulgari, medica, et astrologica," p. 539 *et seq.*, tells us:—"Præcipue autem notatu dignissimum, quod circa *pictas* plantas refert Tournefortius, regis fratrem exquisito artificio *herbarium vivum depictum* possidere, nec secus ac tale Serenissimus rex Prussiæ peregrinis commonstravit." He here evidently refers to drawings, but a few lines further on he gives instructions to make "herbarium, ut vocant, vivum," using the word in its modern sense.

Adrian Spiegel, as far as I know, gave the first instruction for drying plants, in his 'Isagoges in Rem Herbariam,' Leyden, 1606, at the 79th and following pages. On page 78 he recommends the frequent examination of living plants, but adds that during the winter, when nearly all the plants have perished, and so cannot be obtained for examination, one must examine the winter garden (hortos hyemales); by this term, he says, he means volumes which contain plants dried and glued on the paper. It is evident that this method of preserving plants must have been then of recent introduction, as no generally accepted name was in use. I do not find a specific name for a herbarium before Spiegel, yet the thing itself did exist, but when spoken of by authors it was always by a circumlocution.

We know of the existence of several herbaria, which were made about the time of Spiegel; among others, that of Caspar Bauhin (who died in 1624), now at Basle, and that of his pupil Joachim Burser (a great traveller), in thirty folio volumes, now at Upsal. The further however that we go back, the scarcer do herbaria become. It was evidently at this period a very recent and little known invention. We read frequently that botanists sent scarce plants to each other, sometimes as drawings, but sometimes also the plants themselves; and it is very probable the senders retained specimens for themselves, and if so, they must have had herbaria. But do we know anything about the state of these exchanged plants? Mattioli mentions plants sent to him by different parties, in the dedication of the first (1543) and still more of the later editions (1554 and 1565) of his Commentary on Dioscorides, but in such general terms, that it is impossible to tell whether they were specimens artificially dried, or tied in bundles, like the herbs of the modern herbalists, or perhaps young living plants, or seeds only, or, it may be, nothing more than drawings or descriptions. In a letter to Maranta, he states:—"Non negaverim plures me dedisse plantarum imagines, quæ e siccis plantis ad me transmissis dilineari curaverim; sed affirmaverim etiam, quod aquæ gelidæ maceratione contractas e siccitate rugas adeo in iis extenderim, ut hac ratione redivivæ et parum admodum a viridibus distantes viderentur." This might be written by a modern botanist, after having made an analysis of the flowers and fruit, without necessarily implying that the specimens were bad; but in the case of Mattioli, who did not consider a correct representation of the organs of fructification as important, I conclude that the plants were not properly dried, but put up in bundles. In another letter to Georgius Marius, written in 1558, two years after the death of Luca Ghini, he refers to the extraordinary liberality of this great botanist in supporting his work, and says:—"Cum is decrevisset volumina quædam, quæ de plantis conscripserat, una cum imaginibus in lucem edere, visis perlectisque commentariis nostris, non solum ad me gratulatorias scripsit literas, quod illum prævenerim ejusque sublevaverim labores, sed et quam plurimas misit plantas, quas illi sane refero acceptas, ubi earum imaginibus nostram ornavimus Dioscoridem." It is difficult to say whether this refers to well-dried plants, or to drawings prepared by Ghini for his own work. Lobel, in the preface to his 'Stirpium Illustrationes' (London, 1655), considers the drawings published

by Mattioli to be incorrect; he says:—"Hoc iconibus pluribus evenire solet, quando et quoties lineamenta ex plantis siccis *rugosis et contractis* designare cogimur." It therefore seems that he really was not acquainted with properly dried and preserved plants.

We have more certain information about some Italian herbaria of the same period. Ulysses Aldrovandus, of Bologna (born 1522, died 1605), had collected many natural objects, which at his death he bequeathed to the university of his native town. Ovidius Montalbanus, keeper of this collection in the middle of the seventeenth century, records among the manuscripts left by Aldrovandus, an 'Index Plantarum Omnium,' "quas in 16 voluminibus diversis temporibus *exsiccatas agglutinavit.*" Of the nature of this herbarium, which probably contained more so-called curiosities than different species of plants, we may learn somewhat from the singular contents of the 'Dendrologia' of Aldrovandus which was published by Montalbanus, at Bologna, in 1668. The collection of such curiosities depended, no doubt, upon the taste of the collector himself, yet he must have been greatly influenced by the ideas of the times in which he lived. The two herbaria however, mentioned by Andrea Cæsalpino in the dedication of his work 'De Plantis Libri XVI.,' were undoubtedly of a very different kind. "Tibi autem, serenissime Francisce," he says to the Grand Duke, "munusculum hoc, quodcunque sit, nuncupo: tibi enim jure debetur, apud quem exstat ejus rudimentum *ex plantis libro agglutinatis* utcunque a me multo antea jussu Cosmi patris tui compositum cum pollicitatione, ut Deo favente aliquando absolutum traderem. Ejusdem *alterum exstat exemplum* apud clarissimam familiam Tornabonam, Reverendissimo Alphonso Antistiti Burgensi per me similiter paratum; quæ, etsi ob materiæ fugacem naturam nequaquam perennia futura sint, adhuc tamen vigere scio in testimonium eorum, quæ in hoc volumine a me dicuntur; purissimam scilicet stirpium historiam continente, nullis figmentis adulteratam, qualem sæpe in impressis picturis inspicimus." The Grand Duke, Cosmo I., died in 1574; the formation of those herbaria must therefore have been about 1560, if not earlier.

As soon as the method of preserving plants by pressing them between sheets of paper became known, it would be especially useful to botanical travellers, and so we read that Rauwolf brought home five hundred and thirteen *dried plants* from the East, where he was from 1573 to 1576. These were preserved in the library at Leyden, and

were described by Gronovius in his 'Flora Orientalis.' Rauwolf himself, in his 'Aigentliche Beschreibung der Reiss,' etc. (Laugingen, 1583), page 37, says, of two plants which he found near Tripoli, in Syria, "which I have glued among my other foreign plants."

Older still than these must have been that carried by the Englishman John Falconer in his travels, which must also have been very extensive. Amatus Lusitanus, who was at Ferrara from 1540 to 1547, speaks of it as of a singular curiosity, such as he had never seen before. "Quum Ferrariæ mihi contigerit herbatum ire cum nonnullis viris doctissimis et rerum naturalium diligentissimis inquisitoribus, inter quos mihi nominandi veniunt Joannes Falconerius Anglus, vir mea sententia cum quovis doctissimo herbario conferendus, et qui pro dignoscendis herbis varias orbis partes perlustraverat, *quarum plures et varias miro artificio codici cuidam consitas ac agglutinatas afferebat*," etc. I find that Pulteney in his 'History of Botany in England,' i. p. 72, when speaking of Turner, refers thus to Falconer, "Turner, in treating on the *Glaux*, says, 'I never saw it in England, except in Master Falconer's book, and he brought it from Italy.' From this," continues Pulteney, "and other like citations it may reasonably be conjectured, that 'Falconer's book' was an *Hortus Siccus*, and, if so, must have been among the earliest collections of that kind that is noticed in England." That this is really the case can hardly be doubted after reading the above passage from Amatus Lusitanus, so that his book, as Pulteney says, is not only one of the first, but the very first, not only in England, but in the world, of which I can find any definite information.

Shall we then consider John Falconer to be the inventor of herbaria? I think not. Medicine and all the natural sciences were quite neglected in England up to the middle of the sixteenth century. Turner, the contemporary of Falconer, was the first botanical author in England. Both these men acquired their medico-botanical education in foreign countries; Turner chiefly at Bologna, where Luca Ghini was Professor, and Falconer we accidentally find in his travels at Ferrara. It is extremely likely that he visited Ghini, who was the greatest botanist of his age. Then the two herbaria which in age are next to Falconer's, we find in the possession of two scholars of Ghini, viz. Cæsalpinus and Aldrovandus. We do not know when they began to collect, but it is possible that their herbaria were older than Falconer's. Of Ghini's own herbaria nothing definite is known; we have seen that he sent plants

to Mattioli, whose vague expressions regarding them only show that he did not fully appreciate the value of a herbarium. By a letter however from Maranta to Mattioli, it is evident that Ghini sent several plants that were glued on paper and labelled to Mattioli. Maranta writes :— "Scito, plantas omnes, quas ad te Pisis Lucas Ghinus anno abhinc nono misit, mihi prius ab eo fuisse ostensas, inscriptionesque, quas singulis plantis apposuerat, non solum vidisse me, sed etiam descripsisse." This collection seems to have been sent soon after the first edition of Mattioli's Italian Commentary on Dioscorides (1548) was published. If Ghini at this time understood how to spread out and dry plants and so communicate specimens to his contemporaries, I am justified in believing that he, who died in 1556, probably an old man, had long been in the habit of doing this. And when we find that soon afterwards, his two pupils Cæsalpinus and Aldrovandus possessed herbaria or made them for others, it seems clear they learnt this from their master, and that Falconer, whose herbarium existed between 1540 and 1547, was taught likewise at Pisa, or perhaps at Bologna, by Ghini. I am therefore inclined to consider, from all the information before me, that Luca Ghini was the inventor of herbaria. That they were in use much earlier is improbable, from the great interest excited by the few that then existed, from the admiration with which Amatus speaks of Falconer's, and from the want of a distinguishing name for the novel invention.

THE OWALA OR OPOCHALA (*PENTACLETHRA MACROPHYLLA*, *Benth.*) OF THE GABOON AND FERNANDO PO, AND THE OIL CONTAINED IN ITS SEED.

By J. Arnaudon.

Among the products sent by the French Colonies to the Universal Exhibition at Paris, in 1855, was the Owala seed, exhibited as coming from the Gaboon (Western Africa), whence it had been sent under the direction of M. Aubry-le-Comte, now Curator of the Paris Colonial Museum. I could obtain only very vague information at Paris as to the nature of the fruit and the plant to which this seed belongs, and it is only recently that I have been enabled to examine them at Kew.

I succeeded in seeing there the entire fruit, a pod of about 1 foot in length by $1\frac{3}{4}$ to 3 inches wide. Its general shape resembles that of a large haricot, its surface is brown and wrinkled. The two valves open easily, and display four or five seeds, separated from each other by the same number of compartments. Of these seeds those near the ends of the pod are smaller and more angular in shape than those in the centre, which are oval. The length of this seed is nearly double its breadth, its weight varies from $\frac{1}{3}$ of an ounce to $\frac{3}{4}$ of an ounce, and its density is greater than that of water. It consists of two principal parts, a husk and a kernel. The husk very much resembles that of the large chest-nut in colour and brilliancy, but it is thicker and its structure more compact and less elastic. Its surface too is unequal, presenting sinuosities or raised fibres, which extending from the sharp end of the seed, where it is attached to the pod, reunite themselves towards the opposite extremity. The husk is strongly attached to the kernel, though it can be peeled clean off without fracture, and the imprint of the fibres can then be seen on the perisperma or exterior husk. The kernel is of a greenish-white colour, which becomes darker by exposure to the air; it consists of two cotyledons closely united to each other.

Many experiments have shown me that the mean between the weight of the husk and the total weight of the seed, is from 1 to 6; for instance,

Husk	16·66
Kernel	83·34

The quantity of water in the whole seed is $5\frac{1}{3}$ per cent., and of ash $2\frac{6}{10}$ per cent. The husk contains $5\frac{1}{2}$, and the kernel $2\frac{3}{5}$ per cent. of ashes; but the ash of the former contains more silica than that of the latter. The oil of the kernel, although considerable in quantity, is obtained with difficulty by pressure. In an experiment with ether, I obtained from the kernels alone 62 per cent. of oil, and 57·47 per cent. from the seed and husks. When the oil had undergone repeated washings in distilled water, and the superfluous moisture been drained off, its proportion was reduced to 56 per cent. in the case of the almonds, and 50·11 per cent. in that of the whole seed.

This oil, known as *Owala* in the Gaboon, and *Opochala* in Fernando Po, is of a clear yellow colour, but becomes brown when it has been purified. At a temperature of 11 degrees it gradually becomes less limpid, at some degrees lower turbid, and at zero changes into a viscous mass. Its density is very nearly the same as that of olive oil. If this

oil be spread in thin layers over the surfaces of different substances, and left for several days exposed to the air, it still preserves its original fluid state. This property the oil of Owala possesses in common with the oil of *Moringa aptera*, and is valuable for diminishing friction in clockwork.

The oil which I obtained was rather acrid; but this might have been the result of the age of the seeds, and the damage they received by the voyage. It has rather a marked odour, which, however, is by no means disagreeable; it resembles very much that obtained from various pulses. The flavour, too, which it possesses, is an agreeable one; indeed, I have little doubt but that this oil will some day be an acceptable addition to those already in use for comestible purposes; in fact, the Boulons or Bushmen, a tribe in Senegal, employ it in the preparation of their food.

If an attempt be made to dissolve the oil in alcohol without heat, the improbability of success soon becomes apparent; the spirit, however, carries off a peculiar matter as well as a part of its aroma.

One of the most remarkable properties of the oil is the colour which it developes under the influence of sulphuric acid. If the farina, or the oil obtained from the kernel, be dissolved in concentrated sulphuric acid, the mixture takes first an olive, then a violet, and finally a bright crimson-red colour, which will, however, sometimes disappear on the addition of a certain quantity of water. I was induced by the appearance of this phenomenon of colour to seek for the producing cause, and endeavoured to find in what part of the seed this property displayed itself in its maximum of intensity. To accomplish this I commenced by dissolving part of the kernel in water. Upon this solution, the moisture being all drained off, I poured a quantity of concentrated sulphuric acid, and it became slightly brown, but no trace of the red colouring matter appeared. From this experiment I concluded that the part of the kernel wherein lay the power (when aided by sulphuric acid) of producing a red colour was insoluble in water. The same operation was performed upon another portion of the kernel dissolved by the aid of heat in alcohol. This experiment produced a magnificent red colour, and proved that the colouring matter is soluble in alcohol. When ether was substituted for alcohol, the colour produced was no longer red, but violet, which became less intense upon the admixture of ether or alcohol, and this led me to infer that the application of ether changed in a great

degree the nature of the colouring matter, or that to develope the red colour some matter insoluble in ether was necessary. If so, this would be found in the etherized residuum. That the last supposition was correct will be seen from the following experiment:—Having exhausted with ether a certain quantity of kernels, and dried the insoluble residuum, I recovered it again with alcohol boiling. I subjected the alcoholic extract to evaporation, and there remained a viscous mass very similar in appearance to molasses, which become brown when I added a little sulphuric acid. I mingled a little sugar syrup with the oil obtained by ether (which, as I have said, took only a light violet tinge), and poured on the mixture some concentrated sulphuric acid. The mass speedily took first an olive and then a red colour; in fact, the result was the same as in the case of the kernel itself. As I perceived that the absence of sugar was the cause of the etherized extract not developing the red colour on the application of sulphuric acid, I conceived the idea of replacing the natural saccharine matter of the seed by common sugar. Experiment encouraged that idea, for the result in all cases was the same phenomenon of red colour, and therefore the presence of sugar is absolutely necessary to produce it. After I had ascertained in what parts of the kernel that red colour could, by the aid of sulphuric acid, be produced, I was desirous of assuring myself whether exterior agents had any influence on the production of this phenomenon. I first tried the effect of light, and for that purpose exposed one portion of the mixture of the nut and acid to the rays of the sun, and kept another portion in darkness. In both cases the red colour made its appearance after a short time, with nearly the same degree of intensity. The next agent experimented upon was the atmosphere, and two quantities of the solution were kept, the one in the open air, the other in an hermetically sealed vase. The result was that in the latter no colour made its appearance, while in the former it was very vivid. At one time I fancied that the colour was attributable to the admixture of a small quantity of water, but further experiments proved that water was of no service, that oxygen alone of all atmospheric agents had any influence. The path of a current of air passed over the mixture of oil, sulphuric acid, and saccharine, could be traced by the appearance of the bright red-crimson on the parts of the surface exposed to its influence. The pulp, divested of oil by the aid of ether, contains albumen, more or less coagulated; an albuminous matter that

is not coagulated by ether, although it is by alcohol and heat; tannin, precipitated by salts of iron, or carbonate of potash; an azotic matter, combined with an organic acid; a saccharine matter, which is the principal agent in producing the red colour of the oil, by the addition of sulphuric acid. To dye stuffs, it is only necessary to boil them in an infusion of the kernels of the seed of Owala, or of the cake. They are then exposed to the air, and the result is a rich brown colour, and this colour can be varied by the different mordants, or of étain; if put into an iron bath, they become very black.

The seed of Owala may be considered one of those substances which are richest in oil principle. Oil obtained from it can be employed for domestic purposes, in mechanical industry, and in soap-making. The residuum, or *tourteau*, which remains after the extraction of the oil, is a powerful dye, especially to produce black, and the remains of this tourteau used for that purpose will serve for "engrais." Lastly, we have seen that there exists in the kernel a curious principle, at least in a scientific point of view,—viz. that of taking a crimson hue when acted upon by a saccharine matter and concentrated sulphuric acid.

To this, Mr. J. R. Jackson adds the following:—At the time the above article was written, little was known of the habits of the plant, and consequently the native name was all the clue that could be had, with the exception that from the form of the pods, seeds, etc., it was clearly seen to belong to the Leguminous order. Since then, however, Mr. Gustav Mann, who has spent three years in West Tropical Africa, has identified it with the *Pentaclethra macrophylla*, Benth., belonging to *Mimoseæ*. It is a large and handsome forest-tree, with bipinnate leaves, 2–3 feet in length, made up of many trapeziform leaflets, each about an inch long, and the small flowers arranged in a a spicate manner on the branches of a terminal panicle. The pods in the Museum of the Royal Gardens, Kew, which are those sent home by the late Mr. Barter, are not only, as stated in the paper before alluded to, 1 foot long, but quite 2 feet; and this, I understand, is about the ordinary length, the widest part 3 inches, and the thickness of the entire pod about 1 inch. The seeds lie in an oblique direction. One of the most peculiar things connected with the pod is the extraordinary strength of the fibrous tissue of which it is composed. The valves are each a quarter of an inch thick, made up entirely of this strong fibrous substance, the fibres running longitudinally. When ripe, the two valves

burst open with a loud report, scattering the seeds, and, at the same time, each valve contracting and curling round in opposite directions. So great is this power of contraction, that if the pods be bound round with strong wire at the distance even of two or three inches apart, it frequently bursts between its bands as if overloaded inside, but in all cases the membranous lining of the pod remains uninjured. This peculiar habit of contraction was first brought to my notice as the pods were lying amongst other specimens of fruits, seeds, etc., which had been recently brought from a cold room into a warm one, by a motion at intervals amongst the whole collection. Upon examination, I found that the apparent vitality was in the pods of the *Pentaclethra*, the valves of which were gradually rolling themselves into a much smaller compass, of course upsetting the other things by their movements.

The seeds, besides yielding the oil alluded to, are collected at the seasons of their falling, and eaten as food by the natives of Fernando Po.—*From the Technologist*, vol. iii. p. 155, and vol. iv. p. 32.

NEW BRITISH CRYPTOGAMIA.

The descriptions of the subjoined new species of Lichens, Mosses, and Liverworts are extracted from publications which are not likely to be extensively in the hands of botanists.

1. Biatorina (?) halophila, *Hardy*. Thallus effuse, thin, somewhat scaly, the scales narrow elongate, scattered, or loosely gathered into a minutely rimulose crust; testaceo-cinereous, or greyish-white; apothecia hirsute, not very numerous, scattered, plano-convex, never globose, flattened when moistened, finely rugulose, margined or immarginate, sometimes sitting on a scale, black, but more or less purple when moistened. The apothecia somewhat resemble those of *Lecidia fusco-rubens*, Nyl. (specimens of which I have from the Rev. T. Salwey), in their external appearance, but these are smooth, better margined, and of a deeper purple when wet.

Loc. Among shady greywacke rocks on the seacoast at Swallow Craig, near Siccar Point, Berwickshire.

2. Biatorina (?) littoralis, *Hardy*. Thallus effuse, thin, mixed with the hypothallus (?), tartareous, mouldering, rugulose, of a darker

or lighter leaden-grey; apothecia few and scattered, sessile on small elevations of the crust, minute, the disk concave or plane, margin thickish, black, shining; sporidia oblong-oval, bilocular. Of this plant Mr. Mudd, who examined a fragment, says, "The internal structure of the apothecia is similar to those of *Lecania erysibe*, γ. *aipospila*, Borr.; but the external aspect of the whole plant hardly corresponds with that of *aipospila*." Till better examples are procured I place it next to *B. chalybeia*, Borr., which it closely resembles externally.

Loc. In the cavities of red sandstone rocks beaten by the sea at Greenheugh Point, Berwickshire; only a few specimens obtained, and those probably in a degenerate state. (James Hardy, in the Proceedings of the Berwickshire Naturalists' Club, 1863, p. 410.)

3. Ephebe byssoides, *Carrington*. Thallus creeping over *Hepaticæ*, byssoid; filaments as thick as horsehair; tender, olive-blue, polished, terete, flexuose, fasciculately branched, the apices obtuse, bifid; apothecia wart-like, smooth, immarginate, very minute, flesh-coloured; spores numerous and exceedingly small, invisible without a lens, oval(?). In habit and structure this species approaches *Ephebe pubescens*, Fries, which is, however, more rigid, and the thallus is of a sooty-brown colour, brittle, with subulate points, and bearing black warts; besides the gonidia are arranged groups of four or more cells, while in *E. byssoides* they are in moniliform rows.

Loc. In shallow depressed patches, an inch or more in extent, on *Frullania Tamarisci*, var. *microphylla*, Gott., at Glena, Killarney.

This is probably the same plant as that described by Dr. David Moore as *Leptogium Moorii*, Hepp. (*L. anomalum*, Moore, ms.), with the following characters;—Thallus coriaceo-gelatinous, filamentose, fruticulose, terete-compressed, rugose, dichotomously branched; apices obtuse; gonidiac granules scarcely coherent; colour dark olive-green; apothecia unknown. The specimens were obtained from Cromaglown, Kerry, and Glengariff, Cork.

4. Lecidea scapanaria, *Carrington; Dactylospora scapanaria*, Mudd. (in Sched.). Thallus none; apothecia minute, sparingly scattered, coarctate when young, explanate when mature or old; disc plane, dull reddish-black, surrounded by an elevated, somewhat tumid margin of the same colour; hypothecium thin, dark yellowish-brown, grumous; paraphyses short, somewhat lax, pale, their apices dark-brown; asci broadly clavate, 6–8-spored; spores obtusely fusiform,

straight or slightly curved, quadrilocular, pale or dark brown, ·0045 to ·005 inch long, by ·001 to ·00125 inch broad.

This is Nylander's *Lecidea persimilis*, var. *scapanaria*, Lich. Scand. p. 236; but, unless external characters are to be altogether ignored, and all *Lecideæ* with triseptate spores united, it is a good species. It may be readily distinguished by its epiphytic habit, the absence of thallus, and the size and colour of the spores.

Loc. Parasitic on the stems and leaves of *Scapania undulata*, var. α. *major*, Nees, and *S. æquiloba*, Nees, at Cromaglan, Killarney.

5. Ulota calvescens, *Wils.* Habit of *Ulota Bruchii*, Brid.; but with narrower leaves, less dilated at the base; inner perichætial leaves short, obtusate, areolæ minute; capsule oblong-clavate, broadly striate, tapering into a long slender pedicel, not contracted below the mouth when old; vaginula smooth; calyptra glossy, straw-coloured, the apex purple, glabrous or slightly hairy. Fruit,—June, July.

Loc. Immature specimens found by Dr. D. Moore in 1857, and then referred to *U. Bruchii*. Growing in the forks of young oaks, Killarney woods; not unfrequent in Kerry. Fruit mature, June 10th-20th.

6. Gymnomitrium crenulatum, *Gottsche.* Patches dark-brown or nearly black, forming extensive depressed tufts. Stems rhizomatous; branches arcuate, attenuate, rigid, terete, or somewhat compressed; leaves dark-brown, scarcely broader than the stem, bifariously imbricated, erect, ovate, very convex, emarginate, with a broad scariose border; cells minute, discrete, hexagonal, those of the margin hyaline, erose-dentate. This plant, which seems to be the only *Gymnomitrium* found in Ireland, has generally been taken for a variety of *G. concinnatum*, but it is easily known by the crenulate leaves.

Loc. Mountain districts of Ireland; on rocks near the tunnel, Cromaglan. Dunkerrow and Knockavohila, *Dr. Taylor.* Carrantuol, *Dr. D. Moore.* Lugnaquilla, county Wicklow, and Galtymore, *A. Carroll.*

7. Jungermannia obovata, *Nees.* Stems ascending, clothed with purple rootlets; leaves ovate or ovate-rotund, without margin, squarrose-patent, the base saccate; involucral leaves connate with the perianth, the apex free; perianth as long as the involucre, clavate, quadrangular, and with four teeth; capsule subglobose. This species resembles closely *J. sphærocarpa*, Hook., and *J. hyalina*, Lyell. From the former it may be distinguished by the vinous-coloured radicles, and

the perianth being connate with the involucral leaves; and from the latter by its round undulate leaves, increasing in size near the apex, and having larger cells, surrounded by thicker walls.

Loc. Ravine near the Hunting Tower, Cromaglan, growing with *Hypnum micans*, Wils. Torc mountain.—*From 'Gleanings among the Irish Cryptogams,' by Benj. Carrington, M.D., F.L.S.* (London: Pamplin. 1863.)

CHRYSYMENIA ROSEA, *Harv.*

This very rare and interesting seaweed was first discovered early in the century by Sir Thomas Frankland, at Scarborough; he sent it to Mr. Sowerby, who regarded it as a variety of *Fucus Hypoglossum;* the specimen was also examined by Mr. Dawson Turner, who thought it was a variety of *Ulva ligulata*. The original specimen, with these names attached, is in Mr. Sowerby's collection, now forming part of the British Herbarium, in the Botanical Department of the British Museum. It was subsequently for many years unobserved, until Dr. Harvey received it from Miss Watts, who found it at Skaill, in the Orkneys, and he described it as a new species, under the name of *Chrysymenia Orcadensis*, in the second edition of his 'Manual.' Afterwards, obtaining finer specimens, which were found by Mrs. Gatty near the original habitat, at Filey, in Yorkshire, Dr. Harvey figured it in the 'Phycologia Britannica,' under the name of *Chrysymenia rosea*, considering it to be the same as an American species to which he had already given this name.—J. E. Gray.

NEW PUBLICATIONS.

Flora of Surrey; or, a Catalogue of the Flowering Plants and Ferns found in the County, with localities of the rarer species. From the Manuscripts of the late J. D. Salmon, F.L.S., and other sources. Compiled for the Holmesdale Natural History Club, Reigate. By J. A. Brewer. London. Van Voorst, 1863. 12mo, pp. 367.

The metropolitan county of Surrey contains within its area of 789

square miles, much variety both of soil and scenery. There is the Surrey portion of London, with a radius of many miles, in which the suburban element predominates. There is the winding line of the Thames past Staines and Chertsey, Hampton Court, and Kingston. There are the parks and rich meadows and villas and country residences, which crest and cover the low undulations of the country of the London clay. There are abundance of barren sandy heaths, where in autumn the purple of the heather mingles with the golden glow of the autumnal furze. There are the chalk downs, with escarpments of much abruptness, the ridge commanding extensive prospects far away both to south and north. There is the Wealden valley of Holmesdale, well-watered and finely varied with wood and arable and pasture. There are hop-gardens, and at least one extensive natural thicket of Box-bushes; and there is a range of steep barren treeless heathery hills, of which the culminating points fall very little short of a thousand feet in altitude. The county, as a whole, in outline, is nearest a quadrangle of any regular shape. The chalk ridge runs through the centre from east to west, a mere ridge, not more than half a mile in breadth, over Godalming and Guildford, but growing gradually to a width of eight or nine miles in the east of the county, and prolonged through Kent to the seacoast at Dover. This is the range that is known by the name of the North Downs. South of it the beds, with the exception of the alluvium of the river-margins, are all older than the chalk. The Upper Greensand forms the range of steep heathery hills, of which we have just spoken, in the south-west of the county, on the south side of the valley of the Wey. The highest points are Hind Head, near Farnham, in the extreme south-west, which exceeds 900 feet, and Leith Hill, near Dorking, which is about midway between the eastern and western borders of the county, and reaches 993 feet. Looking from the North Downs over Reigate due south to the South Downs over Brighton, the view extends across the fertile, partly sandy, partly clayey valley of the Weald, which occupies portions of Kent and Sussex, and almost the whole of the southern boundary of Surrey. On the north of the chalk ridge, almost one half of the county is occupied by the Tertiary beds of the London basin, undulated considerably, but the undulations nowhere exceeding four hundred or five hundred feet in height; clays and gravels predominating on the side nearest London; the Thames margined often by picturesque wooded knolls, but the in-

terior passing off towards the thin end of the chalk ridge, and western margin of the county about Bagshot, Chobham, and Aldershott, into a thinly populated region, in which uncultivated sandy heaths are the leading feature. Probably, unless Devonshire be an exception, there is more uncultivated heatherland in Surrey, metropolitan county though it be, than in any other English shire on the south side of the Humber. The principal streams are branches of the Thames. The Wey rises in Hampshire, breaks through the chalk at Guildford, and after receiving the drainage of the sandy heaths of the north-west, falls into the Thames at Weybridge. The Mole drains the greater part of the Surrey portion of the Weald, and breaking through the chalk between Dorking and Leatherhead, falls into the Thames, near Hampton Court. The Wandle rises only on the north side of the Downs, and flows from Croydon to the Thames at Wandsworth. Besides these, in the south, small branches of the Arun and Medway come within the county limits.

The present work was planned out and its preparation energetically superintended up to a point of considerable completeness, by an excellent and trustworthy botanist, the late Mr. J. D. Salmon, who for many years resided at Godalming, a conveniently central position for exploration. He died about three years ago, and his manuscripts and collections were purchased by the Holmesdale Natural History Club, which has its head-quarters at Reigate, and placed in the hands of Mr. J. A. Brewer, of that town, also a resident botanist and collector of many years' experience, to prepare the work for publication by adding what he was able from his own observation and what he could obtain from others, and arranging the body of detail thus gathered together. And now we have here the result in the shape of a neat duodecimo of 350 pages, similar in outward appearance and internal arrangement to the recently published Floras of Cambridgeshire and Essex.

The county is not one that could be very conveniently separated into districts founded upon the river-drainage. Mr. Salmon's districts are nine in number, and have apparently been mapped out upon the plan of separating the main quadrangle of the county into nine subordinate squares, or shapes as near squares as suitable boundary-lines could be obtained to limit, the boundary-lines being sometimes the streams and sometimes lines of high-road and railway. The physical features of each of these districts Mr. Salmon had briefly described, and his districts and descriptions are judiciously adopted by Mr. Brewer

with only very slight modification in the latter. These districts are illustrated by an excellent large folding map; and Mr. Prestwich, the well-known geologist, furnishes its counterpart to show the county geology. Maps such as these add greatly to the value and clearness of a county Flora. We are furnished, as in the Floras of Hertfordshire, Cambridgeshire, Essex, and North Yorkshire, with separate lists for each of the districts; the districts in which a species is ascertained to grow being enumerated, when it is mentioned, and the special stations which are given for the rarities being classified under the district initial letters.

The personal observations of Messrs. Salmon and Brewer appear to relate principally to the chalk range and the country on the south of it, but for the north they have had the benefit of Mr. Watson's thirty years' experience; and both for north and south a large amount of information has also been obtained from other botanists, who have resided in or visited different parts of the county. The combination of these varied contributions gives us what is probably not far from a complete enumeration of the plants of each of the nine districts taken separately, so that now there are not many British counties the distribution of species through which is registered more thoroughly.

Mr. Brewer classifies the species according to the 'London Catalogue.' He gives the number of the flowering plants and Ferns of the county as 984, but this is by counting a number of species not reckoned as species in the 'London Catalogue'—a way of reckoning which raises the total number of British plants to 1566. Mr. Watson's estimate, in the fourth volume of the 'Cybele Britannica,' is 840 species for Surrey against 1425 for the whole of Great Britain without Ireland. Of the 250 species of more or less distinctly marked boreal range, only very few reach Surrey at all. The most notable instances of boreal Surrey plants are *Sagina subulata*, *Myrrhis odorata*, *Pyrola minor*, *Vaccinium Oxycoccus*, and the two species of *Chrysosplenium*, all of which appear to be quite of rare occurrence. Mr. Watson states the number of plants generally diffused through Britain as 420. This leaves about as many more for the Surrey plants of more or less distinctly marked austral range in Britain, which is considerably above half the whole number of our austral species. Perhaps nowhere in Britain have we the Germanic species in greater number and abundance than amongst the Surrey Downs and the continuation of the range through Kent.

Of very local Germanic species which grow in Surrey in abundance, we have instances in *Polygala calcarea*, *Phyteuma orbiculare*, *Buxus sempervirens*, *Aceras anthropophora*, and *Herminium Monorchis*. Of other very local austral species which the county yields, there are *Ranunculus tripartitus*, *Elatine Hydropiper*, *Actinocarpus Damasonium*, *Cyperus fuscus*, *Eriophorum gracile*, *Carex depauperata*, *Scirpus triqueter*, and *S. carinatus*; and Mr. Brewer now claims also for the county two of the species recently figured by Mr. G. S. Gibson as special Essex plants, *Lathyrus hirsutus* and *Bupleurum falcatum*. In *Cardamine impatiens* we have a unique instance of a limestone-loving plant of somewhat boreal range that reaches Surrey.

Mr. Brewer speaks modestly respecting the claims to be ranked as indigenous plants of the only two species at all likely to be really wild which Surrey can claim as peculiarly her own, so far as Britain is concerned, *Teucrium Botrys* and *Lilium Martagon*. The writer of this notice is acquainted with the Surrey localities of both species, and for the *Teucrium* has not any doubt that it is really indigenous. Upon the Continent it is tolerably plentiful in the limestone districts of Belgium, and passing through Northern Germany, penetrates into the interior of Russia as far north as Edinburgh, where, though perhaps the summer temperature is somewhat higher than in Surrey, the mean of the year is ten degrees lower. The plant grows in Surrey amongst the scanty rough herbage of the steeply-sloping eastern bank of a ravine in the heart of the chalk downs, and is associated with *Polygala calcarea* and *Hypnum abietinum*. It was unusually plentiful this summer, owing no doubt to the unusual dryness and warmth of the spring having favoured its development. In the western portion of the Continent the *Lilium* is principally a plant of the mountainous region of Central France, and does not descend to the low country of the north-west or reach Belgium. Proceeding eastward, it attains the Palatinate and Silesia, and in Russia penetrates to the central provinces, the climate of which has just been indicated. In the Surrey station it grows in considerable plenty over a space of several hundred yards in a copse-wood consisting principally of Hazels; and though it is a plant that is commonly cultivated, and a road passes through the wood, we did not see anything in the manner of its growth and the plants with which it was associated, to indicate an alien origin, and should, upon the whole, be disposed to think it more likely to be truly wild than introduced.

In most cases Mr. Brewer informs us directly, or in some way indicates, which are the aliens of the Surrey flora; but, occasionally, further observation or greater carefulness in expressing the results of observation as regards the citizenship of species, would have improved the book. For instance, for anything that appears in the Flora, *Hesperis matronalis* may be a plant of hilly Surrey pastures, in the same sense as the *Bee-Orchis*, or *Anacharis* as much an inhabitant of the Surrey streams as *Ranunculus aquatilis*. Mr. Watson's notices of stations are very full of detail, and being so are, as might be expected, often valuably suggestive of points regarding the geography of species, over and above the mere fact that a given plant grows in such and such a place. An interesting part of the book is a copious list of the introduced plants of Mr. Irvine's English 'Port Juvenal,' the Thames side at Wandsworth and Battersea; and it is explained that in this case the species have originated, not with foreign wool, but from the refuse of foreign corn from the Wandsworth water-side distillery. For a county where the hills ascend to nearly 1000 feet, we should have been glad to hear something of the elevation which some of the species attain. There is an elaborate table, at the conclusion of the work, of the geological range of the species, the plants ascertained to grow upon each of the eleven formations being separately indicated. We have studied the book with much interest, and have great pleasure in recommending it to the favourable attention of our readers.

Fragmenta Phytographiæ Australiæ. Contulit Ferdinandus Mueller, Ph.D., M.D., etc. Vol. III. Melbourne, 1862–63. 8vo, pp. 177.

Few botanists have done so much towards making us better acquainted with the vegetation of Australia than Dr. Mueller, the indefatigable director of the Botanic Gardens at Melbourne. Nearly every month he issues a fascicle of his 'Fragmenta,' containing all the new discoveries which his own explorations, those of the Australian expeditions, and the labours of Messrs. Moore, Hill, Maxwell, Beckler, and others, are constantly accumulating. What a gain for science if at all great Herbaria the practice obtained of examining every newly-arrived collection, and carefully describing the new genera and species, in the conscientious manner of Dr. Mueller! Single-handed, and in

an out-of-the-way place, he has done more for systematic botany than many great establishments, with all the facilities and resources of Europe at their back.

We have just received the 23rd fascicle of the 'Fragmenta,' concluding vol. iii. of that valuable work. Amongst a host of new species, we have the following new genera:—*Osbornia* and *Phymatocarpus (Myrtaceæ)*, *Emmenosperma (Rhamneaceæ)*, *Brachynema (Saxifragaceæ)*, *Earlia (Acanthaceæ)*, and *Lachnothalamus*, *Lamprochlæna*, *Elachopappus*, and *Cephalosorus* (*Compositæ*). The plates accompanying this work would be improved if the dissections were less shaded.

Synopsis Plantarum Diaphoricarum. Systematische Uebersicht der Heil-, Nutz- und Giftpflanzen aller Länder. Von Dr. David August Rosenthal. Erlangen: Enke, 1861–62. London: Williams and Norgate. 8vo, pp. 1361.

We have great pleasure in announcing that this work of reference, arranged according to Endlicher's 'Genera Plantarum,' has just been concluded with a supplement. It contains an enumeration of no less than 12,000 plants useful to man, and though a vast number of omissions are apparent, Dr. Rosenthal's 'Synopsis' must be pronounced the most successful attempt hitherto made to throw into the form of a manual all that is known of economic botany. We should like to have seen it more complete; indeed, a person living in any great centre of scientific life could double the number of useful plants here given; but we know the difficulties and the immense expenditure of time and labour required for that purpose, and gladly accept this work until we get something better in its stead. It will soon find a place in every library, and be as indispensable in its way as the works of Steudel, Pritzel, Endlicher, De Candolle, Walpers, C. Mueller, E. Meyer, and Bentham and Hooker are in their respective departments.

During the progress of the work the author has been severely handled by the critics (we ourselves amongst the number), on account of the numerous omissions detected in the first part of his publication. It is gratifying to observe that he has benefited by these criticisms, and given in a supplement all the omissions complained of, with a good deal of additional matter. But it is evident that with every desire to

furnish as complete a synopsis as possible of the *plantæ diaphoricæ*, the materials at his disposal, rich as they are, do not represent the sum total of what economic botany has achieved. An Englishman, though he will find in the book many facts unknown to him and derived from Continental sources, will miss much with which he is thoroughly familiar. We should advise Dr. Rosenthal not to be discouraged by the incompleteness of his present attempt, but to go on collecting additional facts, and give, from time to time, supplements. We strongly advise him to look more closely into the great mass of English books of travel and periodicals than he has done.

Supplement to English Botany, No. 77. London: 1863.

We were pleased to receive this first number of the fifth volume of the 'Supplement to English Botany' in its familiar blue wrapper, which carries us back not only thirty years to the time when Hooker and Borrer edited the first volume, but to the days which our fathers scarcely remember, when Smith and Sowerby issued the first number of their important work. They are now long in their graves, and the earth has closed over many of their successors, Mr. Borrer being one of the last whose loss we had to regret; but others rise in their place, and in Babington for descriptions, and Salter for illustrations, we have worthy successors of those honoured names that have preceded them in this national work. In this very number they are linked on to their predecessors, for three of the species have appended to them the well-known initials of W. B. We defer entering on any critical examination of this number, which contains descriptions of *Salix cuspidata*, Schultz, *Allium triquetrum*, L., *Teucrium Botrys*, L., *Ranunculus peltatus*, Fries, and *R. Baudotii*, Godr. The drawings, executed with the care and accuracy for which Mr. Salter is known, consist of the Willow just named, and five species of Ranunculus, the descriptions of which will be given in the next number.

BOTANICAL NEWS.

Another British botanist has been lost to us by the death of the Rev. W. H. Coleman, M.A., lately one of the masters of the Grammar School, Ashby-de-la-Zouch, and formerly of Christ's Hospital, Hertford. His knowledge of British plants was accurate and extensive, especially in the more difficult genera. Amongst his additions to our flora were *Œnanthe fluviatilis*, Colem., which he was the first to disentangle from the better-known *Œ. Phellandrium*, Lam., and *Carex Bœnninghausiana*, Weihe, both excellently described by him in the Supplement to 'English Botany.' *Rubus Colemanni*, of Bloxham, is only a just tribute to his investigations in that troublesome genus. Unfortunately for botany, his published writings were too few to manifest sufficiently that care and exactness which his friends valued so much in him. Besides this critical acquaintance with species, Mr. Coleman will be longer remembered and more prized in connection with the advanced views he entertained on the geographical distribution of British plants (*vide* 'Phytologist,' 1st ser. vol. iii. p. 217), which were exemplified in Webb and Coleman's 'Flora of Hertfordshire.' This was the first county flora which divided the shire into districts, giving a more or less complete flora of each of them, and exhibiting the relations of the plants to the soils in which they grow in an evident and satisfactory manner. It was indeed a new starting-point for county floras, and all authors who have since produced similar works of any value have followed in the path laid down by Mr. Coleman. He died September 12th, at Burton-on-Trent.

A. and J. Kerner propose to publish an Herbarium of Austrian Willows, to consist in all of about 100 species, in ten decades (price one thaler each), at the rate of two or three decades annually. From the attention which they have paid to this genus, the collection will be of value to all critical botanists. Wagner, of Innsbrück, is the publisher; but they may be had, we believe, through Williams and Norgate, of London.

We have just received the first two parts of 'Annales Musei Botanici Lugduno-Batavi,' by F. A. Guil. Miquel. The richness of the Leyden Herbarium in the plants of the Eastern Peninsula is known to every one acquainted with the magnificent volumes of Blume, or with the works of Korthals, Dozy and Molkenboer, Van der Sande Lacoste, and Miquel, all of which are, to a great extent, founded on the collections at Leyden. Much, however, yet remains to be done; and M. Miquel, in these 'Annales,' proposes to work up some of the unpublished materials. He has secured the assistance of several coadjutors whose acquaintance with the particular families they have undertaken is well known. The work is in folio, each number consisting of eight sheets and one plate. We could wish that more care were bestowed on this single illustration: if bright colouring were the test of a good plate, none could complain, but whoever takes the trouble of comparing the drawing of *Rhododendron Javanicum*, on Plate I., with that in Brown and Bennett's 'Plantæ Javanicæ Rariores' will be surprised with the contrast. The dissections are, however very carefully executed.

Botanical Society of Edinburgh.—*July 9th.*—Professor Balfour, Vice-President, in the chair. The following communications were read:—1. Description of New Genera and Species of Diatoms from the South Pacific (No. 2), by R. K. Greville, LL.D. 2. Description of the Fruit and Seed of *Clerodendron Thomsonæ.* By Professor Balfour. This plant was transmitted by the Rev. W. C. Thomson from Old Calabar, and it has flowered and fruited in the Botanic Garden. The fruit is remarkable for a bright scarlet cellular covering on one side, well displayed when the achenes are becoming ripe. The succulent mass of cells, containing oil-like globules, seems to act in separating the achenes, so that they spread out in a cruciate manner, displaying the scarlet covering on their upper side. The plant, showy both in flower and fruit, is well worthy of cultivation. 3. Notice of a Botanical Excursion to Kielder and Deadwater Fell, on 4th July, 1863. By Professor Balfour. 4. Notice of Mosses found in Fifeshire. By Mr. Charles Howie. 5. Notice of some of the Woods used for Economical Purposes in New Zealand. By Dr. Tuke. 6. Notice of the Chinchona Cultivation on the Neilgherry hills. Transmitted by Dr. Cleghorn. The cultivation of Chinchona is likely to supply a new produce for the trade of India. Mr. Vincent has secured 5000 Chinchona plants for the land he has purchased, and M. de Facien, another enterprising planter, has secured as many more. Altogether, the orders on record exceed the number of plants Mr. M'Ivor (the superintendent of the Ootacamund garden) will be able to supply at the close of the current official year, which we understand will be 34,000. The plants available in the course of the next year, or from May, 1863, to April, 1864, are estimated at 100,000. This will be out of the Government nurseries, but the settings from their own stock which planters in the meantime will have been able to rear, will be something considerable, for a single plant, some six feet high, in the public garden here, has given Mr. M'Ivor no less than 900 cuttings, each the nucleus of a healthy sapling now, with the promise of a gigantic forest-tree hereafter. The enormous source of wealth to which the Chinchona points is actually derived from bricks. When a shoot is taken off a plant it is immediately placed in a pot filled with brick-dust. Hundreds, nay, thousands of these pots may be seen in Mr. M'Ivor's conservatories, covered with what look like nothing more than diminutive leaves thrust into them. Here the shoots are allowed to remain till they recover from the shock attending their severance from the parent stem. They are then transferred to pots charged with a mixture of decomposed felspar and garden mould, in which the process of rooting goes on. Several acres of shola land in the vicinity of the Government garden have been planted, and there can be no doubt that wherever the shade of a forest-tree has fallen upon the interesting suckling below, it has pined and withered, or been stunted. The instances of this effect in a romantic glen to which Mr. M'Ivor will cheerfully lead visitors, are very remarkable. At a few yards from the umbrage of a group of trees, the plants look exceedingly flourishing, but their healthfulness, size, and vigour diminish in proportion to their approximation to shade. Some plants, which were put out in the Government garden in various positions a year ago, fully bear out this result. Those in the shade look sickly, and those subjected to drippings look worse. Mr.

M'Ivor does not consider the Ootacamund plantation a complete demonstration of his principles, that at Neddiwattum being more corroborative of his views; but any one knowing the difference between a healthy and a sickly plant must at once acknowledge that shade is not the condition for the active development of the Chinchona. There are, of course, other important particulars connected with the ultimate success of the Chinchona in India which must be left to time and experiment to establish. We might mention the earliest period of growth at which the alkaloids begin to show themselves, the efficacy of decoctions and infusions made from dry bark and leaves compared with their virtue when prepared with fresh specimens, and the possibility of dispensing in a large measure, if not entirely, with the expensive manufactured article quinine, in the event of bark and leaf possessing sufficient curative properties to be exhibited in most forms of fever disease. One or more of these points, accompanied with the requisite materials for arriving at correct results, will, we believe, be shortly submitted for decision in England. A very interesting feature in the habitude of the Chinchona plant is its power of reproducing its bark, when deprived of it, to a greater thickness than the original formation. This peculiarity, we learn, has been noticed by Mr. M'Ivor, after covering the denuded parts with moss for a month or two; but whether the larger volume of the bark thus produced will contain a proportionate excess of alkaloids is a subject which at present rests in obscurity.

Professor Balfour read a letter received from John Allan Broun, F.R.S., of the Trevandrum Observatory, Madras, in which he says:—"The finest palm of these mountains is the *Bentinckia Condapana*. I think it is the most graceful palm in Northern India. It grows chiefly in the clefts of precipices and among rocks not easily reached; but there are such forests of it on some slopes that we were kept from starving by cutting it down for the cabbage (young shoot), which is delicious. Raw, it is like the finest walnut; but we had it cooked as a vegetable and as a curry, when we had nothing else to eat. Its effect in the foreground in groups, and even in the distance of the landscape, is very fine. It is found at a height of from 2500 to upwards of 5000 feet at the place where I have been, but I have no doubt it would grow at higher stations. I have brought down a few young plants to try to make it grow here. We have a museum here, of which I am honorary superintendent, and I tried to get up a botanic garden, but nothing has been done as yet.

Dr. Richard Gambleton Daunt, Comprinos, St. Paulo, Brazil, sent a specimen of the pod and seeds of *Perovinha do Campo*, said to be used in epilepsy and other diseases in South America.

The following is an extract of a letter from Professor Lawson, Queen's College, Kingston, Canada:—Our botanic garden is making progress. We have about seven acres of land, which is being gradually opened up into flower borders, and many of our students and graduates are active in bringing in roots from the woods, while the citizens of Kingston send contributions from their gardens, and members at a distance seeds and such rare plants as come in their way. We are under great obligation to Professor Asa Gray, who, in the most liberal manner, sent a large collection of roots from Cambridge.

ON THE GEOGRAPHICAL DISTRIBUTION OF THE EQUISETACEÆ.

BY J. MILDE, PH.D.

The first, and as yet only attempt, to enumerate and describe all the known members of the Natural Order *Equisetaceæ* was made in 1822, by Vaucher, in his 'Monographie des Prêles.'*

He describes twenty-three species, of which, however, no less than ten, being synonyms of the other thirteen enumerated by him, have to be suppressed, viz. *E. ramosissimum*, Desf., *E. Burchellii*, Vauch., *E. Timorianum*, Vauch., *E. stipulaceum*, Vauch., *E. Pannonicum*, Willd., *E. incanum*, Vauch., *E. reptans*, Wahlenb., *E. procerum*, Poll., *E. umbrosum*, Meyer, and *E. Veronense*, Poll. These thirteen species, known to Vaucher, are *E. arvense*, Linn., *E. Telmateja*, Ehr., *E. pratense*, Ehr., *E. sylvaticum*, Linn., *E. limosum*, Linn., *E. palustre*, Linn., *E. Bogotense*, Humb. et Bonpl. *E. hiemale*, Linn., *E. elongatum*, Willd., *E. giganteum*, Linn., *E. debile*, Roxb., *E. variegatum*, Schleich., and *E. scirpoides*, Michx. Vaucher held the erroneous view that two plants, though agreeing in all essential characters, ought still to be regarded as distinct species if found in two different continents. In the *Equiseta cryptopora* (*E. hiemalia*, auctor.) he laid too much stress upon the circumstance whether the two rows of stomata were arranged in two lines instead of in one line. This deviation alone induced him sometimes to make a new species. On the other hand, he neglected the most important points, viz. the form of the vagina and the carinæ and valleculæ caulines of the foliola vaginarum. To give only one instance of his way of treating the subject, I may mention that the well-known *E. pratense*, Ehr., is enumerated in three different places, first as *E. arvense*, *A*, *triquetrum*, secondly as *E. umbrosum*, Meyer, and thirdly, as *E. pratense*, Ehr. It should be added that specimens of *E. pratense*, Ehr., are preserved in Vaucher's herbarium; some labelled by Vaucher's own hand *E. arvense*, *A*, *triquetrum*, others *E. umbrosum*, Meyer. The materials at Vaucher's disposal were rather scanty, as is evident from his monograph, and from an examination of Vaucher's herbarium, which has passed into the hands of M. Alphonse de Candolle,

* 'Mémoires de la Société de Physique et d'Histoire Naturelle de Genève,' vol. i. part ii.; Geneva, Paris, 1822.

who kindly sent it to me, together with all the other *Equisetaceæ* in his possession. The attempt Vaucher made could scarcely be expected to be satisfactory, as in his time collectors paid but little attention to the *Equisetaceæ*. The numerous travellers who afterwards brought home these plants often gave names to such forms as appeared to them distinct, but without troubling their heads much about whether they might not possibly be identical with already described ones. Moreover, as till 1844, when Professor Alexander Braun published his excellent monograph of the North American *Equisetaceæ*,* no definite principles had been laid down for circumscribing the species, one botanist attaching importance to this, the other to that character, the nomenclature of the species became very much entangled; an 'Index Equisetorum Omnium' which I have made contains one hundred and sixty-three names for the twenty-six known species, and it is no slight trouble to introduce somewhat like order into such a chaos.

For years I have endeavoured to examine original specimens of all doubtful species, and I have very nearly succeeded. Recently I have described monographically all the exotic species in the Transactions of the Zoologico-Botanical Society of Vienna.† There are only two plants, *E. scandens*, Remy (Enum. Plant. Vascul. Cryptog. Chilensium, Dr. I. W. Sturm, Nürnberg, 1858, pp. 48, 49), and *E. pyramidale*, Goldm. ('Nova Acta,' 1843, xi. Suppl. i. p. 469), both from Chili, which I have not been able to examine; they are probably only forms of already known species; the diagnosis of the former seems to agree well with *E. Bogotense*. Altogether, I know twenty-six species which are thus distributed over the globe.

From the continent which might be expected to yield the most *Equiseta*, viz. Australasia, not one species is known. America contains the most species, viz. twenty-one, amongst them ten peculiar to that continent. Next ranges Europe, with thirteen species, only three of which are peculiar to it. Asia possesses eleven species, of which two are peculiar. Africa has only two species, both of which are common to Europe also.

On turning to the New World, we find that the North American and South American species are distinct, only one species (*E. Schaffneri*, Milde) having as yet been met with both in North and South America,

* Silliman's American Journal of Science and Art, vol. xlvi.

† Jahrgang 1862.

in Mexico and Peru. Six species are peculiar to South America, of which, however, only two enjoy a large geographical distribution, viz. *E. giganteum*, Linn., spread from the West India Islands to the south of Chili, and *E. Bogotense*, Humb. et Bonpl., to be traced from Guatemala to the same southern position as the last-named species, and representing in South America *E. palustre*, Linn. (which is not found in that country), and to which it is closely allied. It is very singular that even the shortest stems of *E. Bogotense* never have a central cavity. Of the other species, *E. xylochætum*, Milde (stem ten feet high and an inch in diameter), is found in Peru, and *E. Brasiliense*, Milde (almost as large as the preceding, and entirely without branches), exclusively in Brazil, whilst the most gigantic of all *Equiseta* (*E. Martii*, Milde) has been discovered both in Brazil and Peru, and *E. Schaffneri*, Milde, as already mentioned, in Peru and Mexico. Curiously enough we also encounter a South European species (*E. elongatum*, Willd.), with very distinct forms, which has been communicated to me from Mexico and Chili. On proceeding northwards, we find in Mexico five species, of which two are peculiar to the country, the gigantic and fine *E. myriochætum*, Cham. et Schlecht., and the *E. Mexicanum*, Milde, a plant allied to *E. elongatum*, Willd. We meet besides *E. Schaffneri*, Milde (in habit resembling *E. limosum*, Linn.), *E. elongatum*, Willd. and *E. robustum*, A. Braun (allied to *E. hiemale*). In California we have *E. Braunii*, Milde, a species very close to *E. Telmateja*, Ehr., and nowhere else as yet observed. In the United States we find, with the exception of *E. pratense*, Ehr., confined to Greenland and Labrador, nearly all the European species, viz. *E. arvense*, Linn., *E. sylvaticum*, Linn., *E. palustre*, Linn., *E. limosum*, Linn., *E. hiemale*, Linn., *E. variegatum*, Schleich., and *E. scirpoides*, Mich. There are, besides, two other species, *E. robustum*, A. Braun (found between 20° N. lat. and 39° N. lat.), and *E. lævigatum*, A. Braun (ranging between 30° N. lat. and 39° N. lat.), both common on the banks of rivers. The most southern locality for *E. hiemale*, Linn., is California. Most species, viz. *E. arvense*, *E. sylvaticum*, *E. palustre*, and *E. limosum*, are met with as far south as Virginia, lat. 36° N.; *E. Telmateja*, Ehr., seems to be confined to the neighbourhood of Lake Erie and Lake Superior. Hooker and Arnott (Bot. Beechey, 1841) record it also from San Francisco, in Upper California; but as we know from thence *E. Braunii*, Milde, which is very like *E. Telmateja*, we may assume that the authors had mistaken

the species, Of the twenty-one American species only eight species (*E. arvense*, *Braunii*, *Telmateja*, *pratense*, *sylvaticum*, *palustre*, *limosum*, and *Bogotense*) are "Equiseta phaneropora;" all the others are "Equiseta cryptopora."

Of the eleven species met with in Asia, *E. diffusum*, Don, and *E. robustum*, A. Braun, have the most limited geographical range. The former grows in elevated regions (Nepaul and Himalaya), the latter is known to A. Braun from Lahore and Pondichery. *E. debile*, Roxb. (*E. Timorianum*, Vauch., *E. virgatum* and *E. laxum*, Bl., *E. scoparium*, Wall., *E. Huegelii*, Milde), very close to *E. elongatum*, and a very polymorphous species, is met with in dry as well as wet places of the elevated regions (as is also *E. elongatum*) of Cashmir, the whole of India, and the islands, including Ceylon, Java, and Timor, as far as Japan. *E. elongatum* is also found in the hotter districts of Asia. In De Candolle's herbarium I have seen specimens from the coast of Malabar. In Western and Northern Asia we encounter numerous old acquaintances, viz. *E. arvense*, *E. Telmateja*, *E. pratense*, *E. sylvaticum*, *E. limosum*, *E. hiemale*, and *E. elongatum*; the last-named species are, however, only in the warmer parts. Six species (*E. arvense*, *pratense*, *sylvaticum*, *limosum*, *hiemale*, and *elongatum*) grow in the Altai, and with the exception of *E. elongatum*, even in the Amur country. But only *E. arvense* seems to extend as far east as Japan, whence I have examined numerous fruiting specimens. Of the two species peculiar to Asia, *E. diffusum*, Don (representing our *E. arvense*), belongs to the "Equiseta phaneropora," and *E. debile*, Roxb., to the "Equiseta cryptopora."

From Africa two species (*E. Telmateja* and *E. elongatum*) are at present known; the former only from the north, the latter distributed in the north (especially as *E. ramosissimum*, Desf.) and in the south, as *E. Burchellii*, Vauch., and *E. Thunbergii*, Wickstr.

Europe, with its thirteen species, does not possess, strictly speaking, a single one peculiar to it, *E. littorale*, Kühlew., being a hybrid, and not counting as a species; and *E. Schleicheri*, Milde, and *E. trachyodon*, A. Braun, must be regarded as subspecies. Of these thirteen species *E. arvense*, *sylvaticum*, *palustre*, and *limosum* are generally diffused; *E. Telmateja* does not occur in Scandinavia, *E. elongatum* is wanting in Scandinavia, Great Britain, and the north-east of Germany, and is represented in England by *E. trachyodon*, A. Braun, a subspecies

characteristic of the west of Germany, and here and there found in the north. *E. pratense* and *E. hiemale* are peculiar to the north, and occur in the south only in high woods; the same may be said of *E. variegatum* and *E. scirpoides*, Michx., the latter especially in Scandinavia.

Of all Equiseta, *E. elongatum*, Willd., enjoys the most extensive distribution; being spread from lat. 51° N. (Breslau) as far as lat. 33° S. (Valparaiso).

The principal results of this inquiry may thus be summed up :—

1. At present only twenty-six species of *Equisetum* can be distinguished with certainty, viz. ten "Equiseta phaneropora" (*E. arvense*, Linn., *E. Braunii*, Milde, *E. Telmateja*, Ehr., *E. pratense*, Ehr., *E. sylvaticum*, Linn., *E. diffusum*, Don, *E. Bogotense*, Humb. et Bonpl., *E. palustre*, Linn., *E. limosum*, Linn., and *E. littorale*, Kühlew.), and sixteen "Equiseta cryptopora" (*E. Martii*, Milde, *E. xylochætum*, Metten., *E. Brasiliense*, Milde, *E. Schaffneri*, Milde, *E. giganteum*, Linn., *E. myriochætum*, Schlecht. et Cham., *E. debile*, Roxb., *E. Mexicanum*, Milde, *E. elongatum*, Willd., *E. robustum*, A. Braun, *E. lævigatum*, A. Braun, *E. hiemale*, Linn., *E. Schleicheri*, Milde, *E. trachyodon*, A. Braun, *E. variegatum*, Schleich., and *E. scirpoides*, Michx.

2. Of all the continents, America contains the greatest number of species, and the most peculiar.

3. Europe contains thirteen species, amongst them two subspecies peculiar to it, and one hybrid.

4. Asia contains eleven species, two of which are peculiar to it.

5. From Africa only two European species are known.

6. From Australia no species is known to us.

It would, therefore, be highly interesting to be better acquainted with the *Equisetaceæ* discovered by Dr. Seemann in the Viti Islands.

[Since the above article was sent to me, Mettenius has indicated an *Equisetum* from New Caledonia (*E. elongatum*, Willd. var., Ann. Sc. Nat. vol. xv. p. 87). The Vitian species is a much-branched one, growing on the banks of rivers, and will be figured in the 'Flora Vitiensis.'—Ed.]

VIOLA ARENARIA, *De Cand.*, AS A BRITISH PLANT.

At the desire of the Messrs. Backhouse, of York, I have drawn up the following statement. For several years past, Messrs. James Backhouse,

father and son, have noticed a small and remarkable-looking Violet growing upon what is called, from its appearance, the Sugar Limestone, at the upper end of Teesdale, on the north side of the river. In 1861, the younger of those gentlemen first observed the flowers of this Violet, and transplanted some of it to his garden at York. It produces perfect flowers for a short time in the month of May; but afterwards, although seeds are ripened, the flowers are without any petals. It remains unchanged by cultivation, except that then it produces a few branches; that is to say, the axillary flowering branches of its rosette, which are usually very short, become two, or possibly three inches long, procumbent, and rather closely leafy. The rootstock is nearly vertical. In the wild state the whole of a flowering plant is usually scarcely two inches across; in one cultivated plant it has exceeded five inches. It may be characterized as follows:—

Viola arenaria, De Cand.; anther-spur very narrowly lancet-shaped, corolla-spur blunt, leaves roundly cordate, flowering branches axillary from a short flowerless central rosette of leaves, peduncles, young leaves, and acute capsules downy, petals broadly obcordate, lower petal with many-branched veins, calycine appendages broad, squarish, persistent.

V. arenaria, De Cand. Fl. Fr. iv. p. 806 (1805); Prod. i. 298; Fries, Mant. iii. p. 121; Herb. Norm. vi. p. 26 (spec.); Koch, Syn. ed. 2, p. 91; Gren. and Godr. Fl. Fr. i. p. 178; Ledeb. Fl. Ros. i. 254.

V. Allionii, "Pio De Viola, 20, t. 1 (1813);" Reichb. Icon. Cent. i. p. 58, t. 72; Icones Fl. Germ. iii. t. 9, f. 4500; Fl. Germ. Exsic. n. 1583 (spec.); Bertol. Fl. Ital. ii. 707.

V. arenaria is known from small forms of *V. canina* and *V. riviniana*, by its more compact habit, spreading shortly ovate stipules, the coat of fine down on the peduncles and the young leaves, and the downy acute capsules. It agrees in its mode of growth with *V. riviniana*, with which the many and very much branched and anastomosing veins of the lower petal connect it. According to Fries the corolla is lilac, Mr. Backhouse says pale slaty-blue; Grenier calls it blue.

C. C. Babington.

ESSAY ON THE METAMORPHOSIS OF PLANTS.

BY J. W. VON GOETHE.—1790.

Translated by EMILY M. COX; *with Explanatory Notes by* MAXWELL T. MASTERS, M.D., F.L.S.

[This translation of Goethe's famous Essay is given, because, though the foundation of all that has been subsequently done in vegetable morphology, no complete English translation has ever been published. Dr. Masters's notes are mainly explanatory and confirmatory, and contain references to the writings of Linnæus, Wolff, and others both of Goethe's predecessors and successors in this branch of botanical inquiry.—ED.]

Introduction.

1. No one who has paid any attention to the growth of plants can have failed to observe that some of their external organs occasionally undergo a change, and assume, sometimes entirely, or in a greater or less degree, the appearance of the organ situated next in order.

2. Thus, for example, a single flower is changed into a double one, petals being developed in the place of stamens, either bearing a perfect resemblance in form and colour to the other petals of the corolla, or still retaining visible signs of their origin.

3. If we reflect that the plant has in this way the power of making an actual retrograde step, and of reversing the order of growth, we shall get more insight into nature's ordinary method of proceeding, and we shall learn to understand those laws of transformation by which she produces one part from another, and exhibits the most different forms by the modification of a single organ.

4. The secret relation subsisting between the different external organs of plants, such as leaves, calyx, corolla, and stamens (which are developed in succession, and, as it were, out of one another), has long been acknowledged by naturalists in a general way; indeed, much attention has been bestowed upon it, and the title Metamorphosis of Plants has been given to the operation by which one and the same organ presents itself to us under various disguises.

5. This metamorphosis is of three kinds,—*regular*, *irregular*, and *accidental*.

6. *Regular* metamorphosis may be equally well styled *progressive;* for it may be observed constantly and gradually at work from the first

seed-leaves to the mature fruit, mounting upwards through a series of transformations, as by an imaginary ladder, to that crowning aim of nature, the propagation of the plant by the male and female organs. I have been attentively observing this process for several years, and it is for the purpose of explaining it that I propose to write this Essay. I shall treat of annual plants only, and the manner in which they progress from the seed to the fruit.

7. *Irregular* metamorphosis might be equally well styled *retrogressive*. For as in the former case nature hastens forward to her great object, she here takes one or more steps backward. In the former instance, with irresistible impulse and powerful effort she forms the flowers and fits them for their office; in the latter she seems, as it were, to relax, and irresolutely leaves her work in an unfinished, weakly condition, pleasing often to the eye, but intrinsically powerless and inactive. By means of practical observations made upon this kind of metamorphosis, we shall unveil that which in the ordinary way of development is concealed from us, and here shall see clearly what there we dare only infer. We may thus hope to attain, with the greatest certainty, the purpose we have in view.

8. We will not take into consideration the third kind of metamorphosis, which is produced *accidentally* and by external causes (especially through the operation of insects),* as it might lead us away from our plain path, and interfere with our object. Occasion may perhaps be found to speak elsewhere of those excrescences, which, monstrous though they be, are nevertheless confined within certain limits.

9. I publish this Essay without illustrations, although in many respects they might appear necessary. I reserve the introduction of them till some future time; an intention which may not improbably be carried out,† as sufficient matter still remains for elucidating and further enlarging the present short and merely prefatory treatise. It will not then be necessary to keep so measured a step as now. I shall be able to introduce much that is illustrative of the subject, and to cite many passages from authors holding similar views. I shall most

* Vid. Dahlberg, Diss. Bot. Metamorph. Plant. sub præsid. Linn. Holm. 1755.

† An edition of Goethe's papers on Natural History was published at Paris in 1837, by Dr. C. F. Martins, accompanied by an atlas containing the author's original drawings, as well as three by Turpin, with notes illustrative of the metamorphosis,—thus carrying out a wish expressed by Goethe in a paper entitled "Wirkung dieser Schrift und weitere Entfaltung der darin vorgetragenen Idee," 1830.

gladly avail myself of any suggestions from those of my contemporaries who are skilled in this noble science, to whom I present and dedicate these pages.

I. *Of the Seed-leaves.*

10. Having undertaken to observe the successive steps in the growth of a plant, let us first direct our attention to it when it begins to germinate. We can, at this stage, easily and exactly distinguish its component parts. Its coverings (which we will not now stay to examine) remain more or less concealed in the soil, and (in many instances) the root is established before the plant exhibits those first organs of its upward growth, which were previously hidden in the seed.

11. These organs are called cotyledons, and also seed-lobes, seed-leaves, etc., from their different forms.

12. They are often unshapely, charged as it were with a crude substance, and very thick in proportion to their breadth; their vessels are not recognizable, being scarcely distinguishable from the general mass; they have, moreover, very little resemblance to leaves, and we are in danger of being led to regard them erroneously as distinct organs.

13. Yet in many plants they nearly approach the form of a leaf; they become flatter, and, on being exposed to light and air, they assume a deeper green; the vessels become recognizable and more like the veins of a leaf.*

14. At length they assume the appearance of true leaves, the vessels are perfectly developed, and their similarity to the leaves, subsequently produced, show that they are not distinct organs, but simply the first leaves of the stem.†

15. Now, as we cannot realize the idea of a leaf apart from the node out of which it springs, nor of a node without a bud, we may venture to infer that the point at which the cotyledons are attached, is the first true node of the plant. This view is confirmed by those plants, which

* The consistence and size of the cotyledons are very generally in inverse relation with the amount of the perisperm or albumen; where this is abundant, the cotyledons are small, or thin and leaf-like, and possess nervures, stomata, etc., like other leaves, and as they are exposed to light and air, they perform the same functions as ordinary leaves do; while the thick fleshy cotyledons remain below the surface of the soil, and seem to serve the purpose of storehouses, whence the young plant may derive nutriment.

† Foliaceous cotyledons may be well seen in the seeds of the Lime, Sycamore, *Ricinus*, etc.

emit buds from the axils of their cotyledons, and develope perfect branches from these first nodes, as the common Bean (*Vicia Faba*).

16. The cotyledons are generally two in number, and here we make a remark, the importance of which will appear more by-and-by. The leaves of this first node often appear *in pairs*, whilst the subsequent leaves of the stem are placed *alternately;* an approximation and connection being thus shown between parts which nature subsequently separates and places at a distance. The case is still more remarkable when the cotyledons appear like a number of little leaves round a common axis, whilst upon the stem, which rises from the centre, the subsequent leaves are developed singly; this may be osberved in the different kinds of Pine, the cotyledons of which are a crown of needle-shaped leaves. As we proceed we shall meet with similar phenomena.*

17. We shall not consider, at present, the plants which have only a single cotyledonary leaf.

18. Let us, however, pause to remark that even those cotyledons which most resemble leaves, when compared with the subsequent stem-leaves, are always imperfectly formed. Their margin is entire, with as few traces of incisions in it as of hairs on the surface, or any of those vessels which are to be observed in perfect leaves.†

II. *On the Formation of the Stem-leaves at the successive Nodes of the Stem.*

19. We are now able to observe with accuracy the successive formation of the leaves, as now the progressive operations of nature all take place before our eyes. Some, or many, of the leaves which now appear, often exist previously in the seed, enclosed between the cotyledons, and are then called the plumule. Their shape, relatively to that of the cotyledons and of the future leaves, varies in different plants; but they

* Duchartre says that the appearance of several cotyledons in the Pines and some other plants, is due to the subdivision of each of the two cotyledons into a number of lobes. (Ann. des Sc. Nat. 3rd ser. vol. x. p. 234.) Whether the four cotyledons of *Nuytschia*, an Australian terrestrial Loranthacea, are due to a similar sub-division, is not stated.

† Occasionally, however, the cotyledons are lobed or notched at their margins, as in the Geranium, while at other times they possess hairs on their surface, as in *Gossypium*, or little vesicular glands, as in Myrtles, etc. These instances do but afford further proofs of the identity between the cotyledons and the leaves. For a full account of the homologies of these organs, see De Candolle, 'Organographie Végétale,' vol. ii. p. 97.

differ most from the cotyledons in being flat and of a delicate texture, and especially in being formed like true leaves, in being perfectly green, and in being situated on a visible node. Their connection with the future stem-leaves can no longer be denied; they are nevertheless inferior to them in the imperfect state of their margin.

20. At each successive node the form of the leaf attains greater perfection; the midrib lengthens, and the side-ribs, which arise from it, extend more or less towards the margin. The different relations of the ribs to each other are the principal cause of the various shapes we observe in leaves,* which are notched, deeply incised, or formed of many leaflets, looking like little branches. The Date Palm is a striking instance of the most simple form of leaf becoming gradually but deeply divided. As the leaves succeed each other, the midrib lengthens, till at last it tears asunder the numerous compartments of the simple leaf, and an extremely compound, branch-like leaf is formed.†

21. The development of the leaf-stalk keeps pace with that of the leaf; the stalk being either closely coherent with the leaf, or so formed as ultimately to be easily severed from it.

22. We see in different kinds of plants that this independent leaf-stalk has a tendency to assume the form of a leaf, as in the Orange; its structure, which for the present we pass over, will afford us matter for future consideration.‡

23. Neither can we now enter upon a closer examination of the stipules; we can only remark in passing that, especially in those instances where they constitute a part of the leaf-stalk,§ they share its future transformations in a remarkable manner.

24. Whilst the leaves principally derive their first nourishment from the more or less modified fluids which they draw from the stem, it is to

* Schleiden, Trécul, and most modern observers hold that the mode of distribution of the ribs of the leaf depends essentially on the form of the latter. De Candolle, however, was of the opposite opinion.

† Trécul describes the leaf of the Date Palm as a compound leaf, the pinnules of which are attached by their points to a cellulo-fibrous cord, which surrounds the whole leaf. By the rupture of this cord, and by the peeling off, in thin scales, of a brownish pellicle, which at first covers the whole surface of the leaf, the pinnules become at length separated from each other. (Trécul, Mém. sur la Formation des Feuilles, Ann. des Sc. Nat. 3rd ser. vol. xx. p. 285.)

‡ As illustrations may be cited the phyllodia, or dilated foliaceous petioles of some species of *Acacia*, *Oxalis*, etc.

§ For a concise account of the different kinds of stipules, see Griffith, Notulæ, vol. i. p. 233.

the light and air that they are indebted for their increased perfection in form, and for the delicacy of their tissue. The cotyledons which are produced beneath the covering of the seed, are charged as it were with nothing but a crude kind of sap, are scarcely at all, or but rudely organized and undefined; in the same way the leaves of plants which grow under water are more rudely organized than others which are exposed to the air; nay, even the same kind of plant will develope smoother and more imperfectly formed leaves when growing in low, damp situations, than it will if transplanted to a higher region, where, on the contrary, the leaves will be rough, hairy, and more delicately finished.

25. So also the anastomosis of the vessels which arise from the ribs, and continually tend to inosculate at their extremities (by which also the cuticle (*Blatthäutchen*) of the leaf is formed), is, if not entirely produced by subtile gases, at least greatly accelerated by them.* The reason why the leaves of many plants which grow under water are capillaceous, is owing to an imperfect anastomosis. This is clearly shown in *Ranunculus aquatilis*, where the aquatic leaves consist of capillaceous veins, whilst in the aerial leaves the anastomosis is complete, and a connected surface is formed.†

26. Experiments have shown that leaves absorb different kinds of gases, and combine them with their sap; these juices are returned in a more refined state into the stem, and thereby eminently promote the formation of the adjacent buds. Gases disengaged from the leaves and hollow stems of different plants have been analysed, and afford the most convincing evidence of this.‡

27. We observe in many plants that one node arises from another. In the jointed stems of the cereals, grasses and reeds, this is obvious; but it is not so obvious in plants whose centre is either hollow through-

* What share subtile gases can have in the formation of the cuticle, and in the inosculation of the veins, is by no means obvious.

† The filamentous condition of the leaves of some water-plants is rather due to the scanty development of the cellular portions of the leaf (*parenchyma*) than to the imperfect inosculation of the fibro-vascular bundles. The leaf of the Lattice-plant of Madagascar, *Ouvirandra fenestralis*, affords a remarkable illustration of the deficiency of parenchyma; here the inosculation of the veins is perfect, but as the spaces between them are not filled up with cellular tissue, the whole leaf has the appearance of lace-work; it may also not inaptly be compared with the so-called skeleton leaves produced by maceration.

‡ The most important recent memoir on this subject is that of Boussingault, in Ann. Sc. Nat. 1862.

out or filled with pith or cellular tissue. The supposed important functions of the pith having been on good ground called in question, and the impulsive and productive power once attributed to it being now unhesitatingly given to the inner side of the second bark (the so-called pulp),* we can more easily understand that whilst an upper node arises from the previous one, and receives the sap by means of it (receives it, too, in a more elaborated condition from the intervening operation of the leaves), it must not only attain to a more perfect state itself, but must consequently transmit a more elaborated sap to its own leaves and buds.

28. Whilst, therefore, the less pure fluids are got rid of, purer ones are introduced, and the plant having been gradually brought into a more perfect condition, attains the end prescribed to it by nature. We see the leaves at length perfectly developed in size and form, and soon become aware of a fresh phenomenon, which tells us that the period we have been observing has reached its termination, and that a new one is approaching, that, namely, of the *Blossom*.

III. *Transition to the Flowering-period.*

29. The transition to the period at which the flower appears, takes place with greater or less rapidity. In the latter case the stem-leaves generally become gradually smaller and less divided, whilst increasing more or less in width at their base; at the same time the space between the nodes of the stem, if not perceptibly lengthened, becomes at least more slender and more delicately formed.

30. It has been observed that if a plant is supplied with copious nourishment, the flowering-period is delayed, but that moderate or even scanty nourishment accelerates it.† The functions of the stem-leaves is thus clearly shown. As long as there are crude juices to be carried off, the plant must be provided with organs competent to effect the task. If superfluous nourishment is forced on the plant, the operation must be continued, and flowering becomes almost impossible. But, on the other hand, if nourishment is withheld, that operation of nature is facilitated and hastened; the organs of the nodes (leaves) be-

* The formative tissue between the wood and the bark of an exogenous tree is now called cambium :—there is growth most active, manifesting itself in the formation of wood on the one side, of bark on the other; therein are the channels by which the elaborated sap mostly passes in its descent.

† Wolff, 'Theoria Generationis,' 1759; Linn. Prolepsis, §§ iii. and x.

come more refined in texture, the action of the purified juices becomes stronger, and the transformation of parts having now become possible, takes place without delay.

IV. *On the Formation of the Calyx.*

31. This transformation often takes place *rapidly;* the stem at once becomes tapering and delicately-formed, and shoots upwards from the node at which the last perfect leaf was developed, terminating in a whorl of leaves collected round an axis.

32. It appears to us a fact capable of the clearest proof, that the leaves of the calyx are the same organs as those whose formation we have hitherto been observing as stem-leaves, though now often in a very altered condition, and collected round a common centre.

33. We have already observed in the cotyledons a similar operation, and have seen a number of leaves, and thus obviously a number of approximated nodes, collected round a central point. The cotyledons of the Pine are a rayed circle of needle-shaped leaves with a definite form; even in the earliest infancy of those plants that vigour of constitution is, as it were, indicated, by which, at a more advanced age, the blossoms and fruit are to be produced.*

34. We further see, in many flowers, unaltered stem-leaves collected together so as to form a kind of calyx immediately below the inflorescence. That they are stem-leaves we need only appeal to the normal appearance still retained, and to botanical terminology, which designates them by the name of *Folia floralia* (bracts).

35. We must now observe the case in which the transition to the flowering-period proceeds *slowly;* the stem-leaves gradually diminish in size, become altered in appearance, and gently insinuate themselves into the calyx, as may be very easily seen in the common calyx (*involucrum*) of Composite flowers; especially in Sunflowers and Marigolds.†

* The force of the argument in this paragraph is destroyed by the researches of Duchartre; see *ante*, note to § 16.

† The nature of the involucre was pointed out by Jung. 'Isagoge Phytoscopica,' 1678, cap. xiv. §§ 14, 15, 23.

Similar instances of the close similarity that exists between the leaves and the bracts constituting an involucre may be seen in many Umbelliferous plants, as the Carrot, in the Anemone, etc. A remarkable instance is figured in the 'Gardeners' Chronicle,' Sept. 11, 1852, of a Dahlia, in which the bracts or scales of the involucre and the paleæ (scales) of the receptacle, instead of retaining their usual membranous state, have all assumed the texture, colour, and veins of leaves, even narrowing their bases into footstalks. So we have seen the bracts of the Plantain, *Plantago major*,

36. Nature's power of collecting a number of leaves round a common axis is seen to produce even a closer union, so as to render these clustered and modified leaves still more difficult to recognize; that is to say, it unites the edges of one with the other, often entirely, but frequently only in part. The crowded and closely-pressed leaves are brought into the nearest contact with each other while yet in a tender state, an anastomosis is effected by the operation of the elaborated juices which the plant now contains, and they thus form a bell-shaped or so-called *monosepalous calyx*, which betrays its compound origin by the manner in which its border is more or less incised or divided. We may find evidence of this by comparing a number of deeply-divided calyces with polysepalous ones, especially if we attentively consider the common calyces (involucres) of many Composite flowers. Thus, we shall find that the calyx of a Marigold, which is defined in systematic descriptions as *simple* and *much divided*, consists both of attached and imbricated leaves, amongst which, as we said above, diminished stem-leaves have, as it were, insinuated themselves.

37. In many plants the number and form in which the calyx-leaves (sepals), whether distinct or united, are arranged round the axis of the stalk, is constant, the same regularity being observable in the other subsequent organs. On this constancy of character depend, in great part, the progress, stability, and reputation of botanical science, which of late years has been making continual advances. There are, indeed, instances in which the number and form of these parts are not equally constant; yet even this inconstancy has not baffled the keen powers of observation which distinguish the masters of this science; they have endeavoured, by means of exact definitions, to impose a strict limit, so to speak, within which these aberrations of nature are restrained.*

38. Nature has thus formed the calyx by *uniting together*, around a common centre, generally in a certain definite number and order, many leaves, and consequently many nodes, which she had previously produced *in succession, and at some distance from each other*. Should, however, the flowering-period have been checked by an excessive and

presenting in all respects the form and size of the ordinary leaves, and we have observed similar changes in the scales of the strobile of the Hop, and in those of the Larch, *Cryptomeria*, etc. In *Podolepis* the bracts are stalked like ordinary leaves. (Vid. Moquin-Tandon, 'Tératologie Végétale,' p. 202.)

* "Calyx tunc plane non differt a foliis proxime ipsi præcedentibus." (Wolff, 'Theoria Generationis,' 1759, § 114.)

superfluous degree of nourishment, they would have remained separate from each other, and would still have retained their original form. Nature, therefore, forms no new organ in the calyx, but simply unites and modifies those organs with which we are already acquainted, and advances by this means a step nearer her object.*

V. *On the Formation of the Corolla.*

39. We have seen how the calyx is produced by highly-elaborated fluids, gradually generated in the plant; and in the same way the calyx itself is destined to become the organ of a future and further degree of elaboration. This will appear easy of belief if we take into consideration the purely mechanical nature of its operation. The state of contraction and compression in which its vessels are now found, as shown above, renders them of an extremely delicate nature, and thus well adapts them for the process of a most elaborate filtration.

40. The transition of the calyx into the corolla is exhibited in various ways; for although the general colour of the calyx usually remains green, like that of the stem-leaves, it often shows a change in one part or another, at the tips, the edges, or at the back, or over the whole of the inner surface, while the outer surface remains green; and whenever this change of colour occurs, we see it combined with an increased refinement of texture. In this manner an ambiguous kind of calyx is produced, which might with equal propriety be called a corolla (perianth of Linnæus).†

* Wolff, Nov. Comm. Acad. Petrop. pp. 403, 1766, 1767; Linn. Prolepsis, § 6. The resemblance of sepals to leaves is well shown in *Agrostemma Githago*, some kinds of Rose, of Pæony, of Gentian, of *Mesembryanthemum*, etc., while in the Camellia, and a great number of other plants, the sepals are not arranged in a verticillate manner, but are disposed in a spirally imbricated arrangement, as is commonly the case with ordinary leaves. On the other hand, the whorled leaves of all the *Stellatæ*, etc., may be adduced to show the similarity between such an arrangement, and that which usually obtains in the calyx. Floral leaves or bracts are frequently only to be distinguished from ordinary leaves by their position at the base of the flower; at other times the bracts gradually assume more and more of the appearance of the sepals, as in *Calycanthus*, *Berberis*, *Cactus*, and others, in which no definite line can be drawn between sepals and bracts. In *Peganum* and *Cruckshanksia*, the sepals are even provided with stipules. Few plants show the gradual passage of leaves to bracts and sepals so well as *Helleborus fœtidus*.

† Linn. Prolepsis, § 8. The sepals of the white Water Lily, *Nymphæa alba*, are of an olive-green colour on the outside, and of a white or pinkish hue on the inner side. The tips of the sepals in the *Helleborus fœtidus* are of a purple colour, and other Ranunculaceæ furnish instances of coloured calyces in the Winter Aconite, Larkspur, Aconite, Columbine, Anemone, etc. The Fuchsia is a well-known instance of the same thing.

41. We remarked that from the seed-leaves upwards a great development takes place both in the size and form of the leaves, especially in their margins, and that a subsequent diminution of their size occurs in the calyx; we have now to observe a second act of expansion, by which the corolla is produced. The flower-leaves (petals) are usually larger than the calyx-leaves (sepals), and it is to be remarked that as a contraction of the organs occurs in the calyx, so (having been in a high degree refined by means of a further filtration of the fluids in passing through the calyx) they again expand in the form of petals, and assume the appearance of entirely new and distinct organs. Their delicate organization, their colour, and their scent would make it impossible to recognize their origin, if we had not frequent opportunities of stealthily observing nature when departing from her general rule.

42. Thus, for instance, within the calyx (epicalyx) of a Pink a second calyx is often found, which, being partly green, was to all appearance originally designed for a monosepalous notched calyx, but its jagged tips, and edges transformed into incipient and spreading petals, betray, both by their colour and texture, the relationship that exists between the corolla and the calyx.

43. The relationship of the corolla to the stem-leaves is also shown in different ways; for stem-leaves already more or less coloured may be seen on many plants, far below the inflorescence, those nearest to it being coloured throughout.*

44. Those instances also in which nature, as it were, altogether omits the calyx,† afford additional opportunities of observing the transformation of the stem-leaves into petals. On the stalks of tulips, for example, a coloured petal, almost perfect in form, may often be seen. The case is even more remarkable when a leaf, half green and half coloured, remains attached to the stem by the green part as more properly belonging to it, whilst the coloured portion is carried up with the corolla, so that the leaf is literally torn asunder.‡

* The brightly coloured bracts in some of the species of *Salvia*, *Euphorbia*, *Poinsettia*, etc., afford good illustrations of the facts mentioned in this paragraph. We have also seen several instances where the involucre of the garden Anemone had assumed as brilliant a crimson colour as the calyx itself.

† Where but one whorl exists on the outside of the stamens or pistils, that one is called a calyx, irrespective of its colour. The term 'perianth' is applied in some cases where it is difficult to distinguish the calyx from the corolla.

‡ Prolepsis, § 7. Instances of the substitution of ordinary leaves for petals in Roses, in Clover, and other plants, are not uncommon. We have seen such in *Petunias*, *Lychnis*, etc. See Moquin-Tandon, 'Tératologie Végétale,' pp. 203–7 and 230.

45. There is great probability in the opinion that the colour and scent of the petals is to be ascribed to the presence of pollen within them; it probably exists in them in an imperfectly disengaged state, or rather combined with and diluted by other fluids. The very beauty of the colours induces the idea that the substance contained in the petals, though in an extremely purified condition, has not yet attained the very highest degree of purity, at which stage it appears white and colourless.*

VI. *On the Formation of the Stamens.*

46. The opinion alluded to in the last paragraph will appear still more probable, when we consider the close connection which exists between the petals and the stamens. If the connection between all the other organs were as obvious, as universally noticed, and considered as indubitable, the present essay might be thought superfluous.

47. Some plants normally produce their petals in a transitional state; as *Canna*, and other plants of the same family. In this instance a true petal, but slightly changed, is contracted at the upper part, and exhibits an anther, in relation to which the rest of the petal stands in the place of the filament.†

48. In those flowers whose habit it is to become double, we may trace this transition through all its different stages. In Roses, among perfect coloured petals, others may often be seen which are contracted both in the middle and at the side. This is occasioned by a little protuberance more or less resembling a perfect anther, and in the same proportion the whole petal assumes the form of a stamen. In the case of many double Poppies, some of the petals of the very double corolla

* In accidental cases, where the petals assume more or less the appearance of stamens, or *vice versâ*, the pollen may be said to be in the petal; and in the common Mistletoe the inner surface of the flower has numerous small depressions in which the pollen is lodged, but it seems little better than a fancy to attribute the colour and scent of the petals of an ordinary flower to the pollen contained within them. The true cause of these phenomena is very imperfectly known; coloured liquids in the cells of the petals are in many cases the source of the colour, and volatile oils contribute in some cases to their odour, but for the most part we are ignorant of the cause of the exquisite perfume of some plants.

† The flowers of *Canna* have three sepals, an irregular corolla in five or six divisions; the whole of the stamens are replaced by petals, with the exception of one half-anther placed on the side of a petaloid filament. The style, which in the adult state is simple and flattened like a petal, offers in its earliest condition three small divisions, corresponding to the three carpels of the ovary. (See Barnéoud, Ann. des Sc. Nat. 3rd ser. Bot. viii. p. 344.)

are little changed, and tipped with perfectly developed anthers; whilst others are more or less contracted by anther-like protuberances.*

49. When all the stamens are changed into petals, the flower produces no seed, but if any of the stamens are developed whilst the process by which the flower becomes double is going forward, fertilization may take place.

50. A stamen, then, is produced by the re-appearance of the selfsame organ diminished and refined, which we just before saw expanded as a petal. The truth of the proposition put forward above is hereby again confirmed, and our attention becomes still more closely riveted on this operation of alternate contraction and expansion, by means of which nature at length attains her object.†

VII. *Of the Nectaries.*

51. However rapidly the transition takes place in many plants from the corolla to the stamens, we nevertheless perceive that nature cannot always effect it in a single stride; that is to say, she produces intermediate organs which, in their form and office, at one time resemble the petals, and at another the stamens. Though varying extremely in form, they may nevertheless be almost all comprehended under one idea, namely, that *there may be slow stages of transition between the petals and the stamens.*

52. Most of these differently-formed organs, which Linnæus called nectaries, may be thus defined; and here we have fresh reason to admire the great penetration shown by that extraordinary man, who without clearly comprehending their office, yet ventured, in reliance upon a surmise, to include apparently different organs under one and the same name.

* The transition from petals to stamens may be well seen in the common white Water Lily, in some species of *Atragene*, etc. In *Bocagea viridis* there is no difference in form between the stamens and the petals. Double flowers result from the substitution of petals for stamens or pistils, and from other causes. See De Candolle, Mém. sur les Fleurs Doubles, Mém. Soc. Arc. t. iii. p. 402, and Moquin-Tandon, 'Tératologie Végétale,' p. 211.

† Wolff's original opinion was that the stamens were equivalent to so many buds placed in the axil of the petals or sepals (see 'Theoria Generationis,' 1759, § 114)—an opinion which more recently has received the support of Agardh and Endlicher. Wolff himself, however, seems to have abandoned his original notion, for in his memoir, "De formatione intestinorum præcipue tum et de amnio spurio aliisque partibus embryonis Gallinacei, nondum visis," etc., in Comm. Acad. Petrop. xii. p. 403, anno 1766, he considers the stamens as essentially leaves. See also, Linn. Prolepsis, § viii.

53. Many petals, without being perceptibly altered in form, nevertheless indicate their relation to the stamens by having little cavities, or by glands attached to them, from which a honey-like liquid exudes. That this may possibly be the fructifying mixture in a yet imperfect, unelaborated state, we may partly conjecture on the grounds above alleged, and this will appear still more probable from reasons to be presently adduced.*

54. In other instances the so-called nectaries assume the appearance of independent organs, and under this disguise they sometimes mimic the petals, sometimes the stamens. Take as examples the nectaries of *Parnassia*, in which thirteen filaments, each tipped with a little red ball, bear a strong resemblance to stamens; or *Vallisneria* and *Feuillæa*, where they are like filaments without anthers; or *Pentapetes*, in which they have a leaf-like form, and are arranged in a circle alternating regularly with the stamens. In systematic works these organs are described as *filamenta castrata petaliformia*. Similar ambiguous formations occur in *Kiggellaria* and the Passion-flower.

55. The name of nectary, as explained above, may be equally well applied to the peculiar *accessory corolla* ('paracorolla,' Schleiden). If the formation of the petals is produced by expansion, the accessory corolla is the result of contraction, as in the case of the stamens. Thus we sometimes see within a perfect and wide-spreading corolla, a smaller and contracted accessory one, as in *Narcissus*, *Nerium*, and *Agrostemma*.†

* At the base of the petals of the Crown Imperial, *Fritillaria imperialis*, there exists such a gland as that mentioned in the text.

† The crown of the *Narcissus* has been the subject of much discussion among botanists, and its real nature can hardly be said to be yet satisfactorily made out. M. Gay (in Bull. Soc. Bot. France, vi. 1859) gives a concise account of the opinions of previous observers. His own opinion seems to be nearly the same as that of Schleiden, and that the organ in question is formed from the confluence of six intra-perianthial stipules ('ligules,' Schleiden). Our own observations, so far as they go, lead us to support Dr. Lindley's views that the corona of *Narcissus* is composed of a row of antherless stamens, whose filaments are petaloid and coherent. M. Gay's objections to this view do not appear to us valid, while, on the other hand, Dr. Lindley's opinion is supported by the analogy of *Pancratium*. Moreover, in *N. incomparabilis* the corona is somewhat six-lobed, the lobes alternating with the segments of the perianth on the one side and with the stamens on the other; again, the divisions of the cup which are placed opposite to the outer segments of the perianth overlap the remaining ones, which oppose the inner pieces of the perianth,—an arrangement recalling the similar disposition of the stamens in the common *Polyanthus Narcissus*. In *N. montanus* we have seen, for several years in succession, anthers placed on the corona, and the latter sometimes divided into segments, not differin-

56. Still more striking and remarkable alterations are produced in the petals of different plants. A small cavity, filled with a honey-like liquid, occurs in the inner base of some flowers. This cavity is much deeper in some families and species than in others, and is elongated at the back of the petal in the shape of a spur or horn, the rest of the petal being also more or less modified in form. The genus *Aquilegia* is a good example of this.*

57. The nectary is most disguised in *Aconitum* and *Nigella*, but even here its similarity to the 'leaf-form' may be perceived by a little attention; it has a strong tendency in *Nigella* to become petaloid, the flower becoming double from the altered nectaries. In *Aconitum* the resemblance of the nectaries to the helmet-shaped sepal, beneath which they are concealed, is evident.†

58. Having observed above that the nectaries may be considered as transitional organs between petals and stamens, we may here introduce a few remarks on irregular flowers. In *Melianthus* the five outer divisions may be described as true petals, and the five inner ones as an accessory corolla consisting of six nectaries, of which the superior one is most like the petals, whilst the inferior one, commonly called the nectary, most differs from them. In the same sense the keel of papilionaceous flowers‡ might be called a nectary, since of all the petals it is nearest in form to the stamens, whilst it differs widely from the leaf-like form of the standard (vexillum). Thus also the brush-like

from the ordinary stamens except in the breadth of the filament. Anthers so placed are commonly met with in some of the double *Narcissi*.

Schleiden also asserts that the nectaries of *Ranunculus* and *Parnassia*, the scales of *Sileneæ*, and the crown of the Passion-flower, are secondary productions from the petals, and not independent foliar organs; but, on the other hand, some of the rays of the crown of the Passion-flower have been observed to be replaced by anthers (Moquin-Tandon, 'Tératologie Végétale,' p. 220), while in *Passiflora Murucuja* the rays are combined into a cup, like that of *Narcissus* or like that of *Melia*, except that it does not bear anthers. In *Saponaria* and some others of the *Sileneæ* we have remarked the scales of the corona bearing anthers as though they were referable to the adhesion of two stamens, the anthers of which are usually wanting (Journ. Linn. Soc. i. 1857, p. 159).

* In *Angræcum sesquipedale*, an Orchid native of Madagascar, the nectary measures nearly a foot in length.

† The parts called by Goethe nectaries, in the Aconite, Nigella, etc., are now considered as petals, the outer pieces as sepals, in spite of their colour and form. In the Winter Aconite, *Eranthis hyemalis*, a transition may sometimes be seen between the large, flat, coloured sepals and the small, tubular, greenish petals (nectaries).

‡ The keel in papilionaceous flowers is evidently formed by the junction of two petals.

appendages attached to the end of the keel, in some species of *Polygala,* may be explained, and a distinct idea formed as to what these organs really are.

59. It would be superfluous to assert that it is not the object of these remarks to re-entangle what has been separated and classified by the labours of observers and systematists; the intention is simply to render the different forms of plants more susceptible of explanation by means of the views here put forward.

VIII. *A few more Remarks on the Stamens.*

60. It has been placed beyond all doubt, by microscopic observations, that the stamens and pistils, no less than the other organs of plants, are produced by spiral vessels. We found an argument upon this as to the intrinsic identity of the various parts of plants, however different the forms under which they appear.*

61. Now the spiral vessels being situated in the very centre of the bundles of sap-vessels, and entirely surrounded by them, we shall be able to form a truer estimate of their strong contractile power, if we imagine them (as, indeed, they have all the appearance of elastic springs) in the very act of exerting their utmost force, till having gained the mastery, they altogether overcome the expansive power of the sap-vessels.

62. The ramification of the bundles of sap-vessels is now rendered impossible, nor can they any longer unite and form a network by anastomosis; the (cellular tissue) which generally fills up the interstices of the network is no longer developed; all the causes which produced the expansion of the stem-leaves, the sepals, and the petals, are at an end, and an extremely simple little filament makes its appearance.

63. No sooner are the delicate membranes of the anther formed, than the extremely attenuated sap-vessels terminate in them. And now, if it be admitted that these are the very same vessels in a state of extreme contraction as those which before were continually increasing in length, ramifying and uniting with each other; if at this stage, moreover, we see highly organized pollen developed from them,† which

* It can hardly be correctly said that the stamens and other organs of plants are produced by spiral vessels, since all these parts begin as little knobs or pimples of fine cellular tissue, and spiral vessels are not formed therein till after development has proceeded some way.

† The mode of explaining the formation of the pollen is now known to be incorrect.

compensates by its energy for what those vessels have lost in power of expansion; if, when this pollen is set free, it immediately seeks the pistils (placed by nature in close proximity with the stamens), if it attaches itself to the pistils, and imparts its influence to them,—then are we by no means averse to consider the union of the male and female organs as an ideal anastomosis,* and we think that, for the moment at least, we have brought the ideas of growth and reproduction a step nearer to each other.

64. The subtile substance which is organized in the anthers looks like mere powder, but the little pollen-grains are in fact nothing more or less than vessels (cells) in which an extremely refined moisture is enclosed. We coincide, then, in the opinion of those who maintain that this moisture is absorbed by the pistils to which the pollen-grains attach themselves, and that thus the fructification is effected. This appears the more probable, from the fact that some plants secrete no pollen-grains, but moisture only.†

65. We are here reminded of the honey-like liquid of the nectaries, and its probable connection with the elaborated moisture contained in the pollen-grains. Perhaps the nectaries are preparatory organs, and their honey-like moisture may possibly be absorbed, perfected, and fully elaborated by the anthers; an opinion which derives greater probability from the disappearance of this fluid after fructification has taken place.‡

66. We must not omit a cursory remark as to the different ways in which the filaments unite with each other in some flowers (Monadelphia, etc.), and the anthers in others (Syngenesia), exhibiting the most curious examples of anastomosis and combination between organs which at an earlier stage were perfectly distinct.

* The discovery of the pollen-tubes has rendered this far more certain than it was at the time when Goethe wrote.

† It is needless to do more than remark that modern research has completely shown the falsity of the opinion stated in this paragraph.

‡ Vaucher (Hist. Phys. Pl. Europ. p. 13) held that the honey-like liquid of flowers plays a very important part in the fertilization of the ovule, especially by dissolving the pollen and fitting it for its office. He pointed out the existence of nectaries or secreting organs in many flowers where they had not previously been detected. See also Brongniart, 'Sur les Glandes Septales de l'Ovaire,' Ann. Sc. Nat. 4th ser. ii. p. 1. Darwin ('On the Various Contrivances by which British and Foreign Orchids are Fertilized by Insects,' 1862, p. 278, etc.) shows that the nectar is of the highest importance to Orchids, by attracting insects, without whose agency fertilization could not be effected.

IX. *On the Formation of the Style.*

67. If thus far our object has been to show that the different organs of plants, developed in succession, are intrinsically identical, however unlike externally, it will be easily conjectured that our next aim will be to explain the structure of the pistil on the same principle.

68. We will first consider the style as independent of the fruit, as indeed we often find it in nature, and the fact of its being thus distinct will make our task the easier.

69. The style then, we observe, is to be referred to the same period of growth as the stamens; the stamens, that is to say, are the result of contraction, and the same thing may be often asserted of the styles; if, indeed, their proportions do not always keep pace with those of the stamens, the difference in their length is but slight. In many instances the style has almost the appearance of a filament without an anther, and they are more nearly allied in external form than any of the other organs. Since both are produced by spiral vessels,* it becomes so much the more evident that neither pistils nor stamens are distinct organs, and if by this consideration their close relationship is rendered obvious, it appears to us that the idea of an anastomosis, as applied to their union, is both appropriate and intelligible.

70. We often find that the style is composed of many single styles united; the parts which compose it are scarcely discernible even at the tip, nor even there are they always separated. Such adhesion (upon the effect of which we have already often remarked) may easily take place in this instance, indeed it must inevitably occur, because these delicate organs, before the time of their perfect development arrives, are pressed together in the centre of the flower-bud, and may there effect the very closest union.

71. There are many instances of a constant kind in which nature shows us more or less clearly the connection of the style with the preceding organs of the flower. The style of the *Iris* and its stigmas, for example, are obviously petaloid. The shield-shaped stigma of the *Sarracenia* betrays, though less obviously, that it is composed of several leaves, and even the green colour is retained. If we call in the aid of the microscope, we find many stigmas, as for example those of the *Crocus* and the *Zannichellia*, formed like perfect mono- or polysepalous calyces.

* See note to § 60.

72. Nature not unfrequently affords us instances in which, by a retrogressive movement, the style and stigmas are reconverted into petals. It is, for example, by such a transformation that *Ranunculus Asiaticus* becomes double, the anthers being often found unchanged immediately beneath the corolla. Some other remarkable instances will be mentioned by-and-by.*

73. We must here repeat the observations before asserted, that the style and stamens are to be referred to the same period of growth, and that they hereby afford a fresh illustration of the argument by which we endeavoured to prove a process of alternate expansion and contraction. From the seed to the topmost stem-leaf we observed the work of expansion going forward; we next saw the calyx produced by means of contraction, the petals by expansion, and again the stamens and pistils by contraction. Presently we shall have to observe the highest degree of expansion in the fruit, and the utmost concentration in the seed. In these six steps unwearied nature completes her never-ending work of reproduction, by means of the male and female organs.†

INFLAMMABILITY OF THE FLOWERS OF *DICTAMNUS ALBUS.*

When the daughter of Linnæus one evening approached the flowers of *Dictamnus albus* with a light, a little flame was kindled without in any way injuring them. The experiment was afterwards frequently repeated, but it never succeeded; and whilst some scientific men regarded the whole as a faulty observation or simply a delusion, others endeavoured to explain it by various hypotheses. One of them especially which tried to account for the phenomenon by assuming that the plant developed hydrogen, found much favour. At present, when this hypothesis has become untenable, the inflammability of the plant is mentioned more as a *curiosum*, and accounted for by the presence of etheric oil in the flowers. Being in the habit of visiting a garden in

* Linn., Prolepsis, § ix., mentions some flowers of *Carduus heterophyllus* and *C. talaricus* in which "the style had grown into two green leaflets, the calyx and corolla were also leaf-like in these flowers."

† See Braun, 'Rejuvenescence,' Henfrey's translation for Ray Society, 1853, p. 60.

which strong, healthy plants of *Dictamnus albus* were cultivated, I often repeated the experiment, but always without success, and I already began to doubt the correctness of the observation made by the daughter of Linnæus, when, during the dry and hot summer of 1857, I repeated the experiment once more, fancying that the warm weather might possibly have exercised a more than ordinary effect upon the plant. I held a lighted match close to an open flower, but again without result; in bringing, however, the match close to some other blossoms it approached a nearly faded one, and suddenly was seen a reddish, crackling, strongly sooting flame, which left a powerful aromatic smell, and did not injure the peduncle. Since then I have repeated the experiment during several seasons, and, even during wet, cold summers, it has always succeeded, thus clearly proving that it is not influenced by the state of the weather. In doing so I obtained the following results, which fully explain the phenomenon. On the pedicels and peduncles are a number of minute reddish-brown glands, secreting etheric oil. These glands are but little developed when the flowers begin to open, and they are fully grown *shortly after* the blossoms begin to fade, shrivelling up when the fruit begins to form. For this reason the experiment can succeed only at that limited period when the flowers are fading. Best adapted for the purpose are those panicles which have done flowering at the base, and still have a few blossoms at the top. The same panicle cannot be lighted twice. The rhachis is uninjured by the experiment, being too green to take fire, and because the flame runs along almost as quick as lightning, becoming extinguished at the top and diffusing a powerful incense-like smell.

DR. HAHN.

NOTES FROM NORTHUMBERLAND, SEPTEMBER, 1863.

Fumaria Boræi, Jord. Hedgebank at Preston, near North Shields.

Sinapis muralis, var. *Babingtonii*, Syme. Plentiful on ballast at Seaton Sluice.

Arenaria leptoclados, Guss. Characteristic specimens on Hartley Links, near the station for *Anchusa officinalis*, which latter, at any rate for the time being, has entirely disappeared.

Rubi. The Brambles of Northumberland are, so far as I know, en-

tirely unrecorded since Mr. Babington has taken the genus in hand. In the list in the third volume of the 'Cybele,' not a single species is given from the county, and only three from the Tyne province.

R. rhamnifolius, Weihe. The large cordate-leaved form, in excellent condition, in a lane between Bardon Mills and Chesterholme. A less robust and more ovate-leaved plant, on Whitley Links; and what is probably a *microphyllus* variety of the species, in a lane near Bardon Mills.

R. discolor, Weihe. Hartley Links, etc.

R. leucostachys, Smith. With the preceding, on Hartley Links.

R. villicaulis, Weihe. Hedge of lane between Bardon Mills and Chesterholme. I have looked for this in vain in Yorkshire.

R. umbrosus, Arrh.; *R. carpinifolius*, Bloxam. Whitley Links, hedges near Bardon Mills and Seaton Delaval; thickets in Holywell Dene, etc.

R. rudis, Weihe. In good condition, with *R. Kœhleri*, in thickets at the lower part of Holywell Dene.

R. Radula, Weihe. Thickets in the Seaton Delaval Avenue; hedges, near the Hartley Junction Station.

R. Kœhleri, Weihe. Abundant in Holywell Dene, hedges near Bardon Mills, etc. etc. The variety *pallidus*, in the shady parts of Holywell Dene. An allied plant, with equally prickly, stem leaves strongly-veined beneath, but seldom quinate, and then the basal pair sessile and imbricated, with a fastigiate, level-topped panicle, and sepals adpressed to or loosely reflexed from the fruit, forms extensive thickets on the Links, north of Whitley.

R. diversifolius, Lindl. Thickets in the ravine of the Bardon Burn, below Chesterholme.

R. corylifolius, Smith. Hedges, near Whitley, Seaton Deleval, Bardon Mills, etc.

R. cæsius, L. Hartley Links, etc.

Pastinaca sativa. The *Pastinaca* of the ballast hills seems to be all *P. pratensis*, Jordan, the common English form. The seeds are ovate, the leaves dull and slightly hairy on the upper surface, and the umbel has seven to ten rays.

Polygonum Raii, Bab. Of this species Mr. W. N. Brown and I gathered good specimens in characteristic fruit, in two or three places amongst the Links between the village of Seaton Sluice and the mouth

of Meggy's Burn, near Blyth. Mr. T. J. Foggitt has just shown it to me, also from the Durham coast, near Seaton Carew. It is new to the Tyne province, and Mr. Watson ('Cybele,' iii. p. 338) considers that its occurrence at all on the east side of Britain requires confirmation. Good specimens of *P. microspermum*, Jord., were obtained near the same place in Northumberland,

Juncus diffusus, Hoppe. Banks of the little stream not far from Bardon Mills Station, where the *Hieracium*, formerly called by Babington *rigidum*, variety *pictum*, grows.

Triticum acutum, De Cand. Plentiful at St. Mary's Island, and growing also upon Hartley Links. Leaves with closely-placed, rough, hairy ribs, hardly at all enrolled, except quite at the apex, and the point not sharp, axis of the spikelets smooth.

J. G. BAKER.

ON THE NATURAL ORDER CHARACEÆ.

Professor A. Braun, in his monograph of this Natural Order, stated at the above-mentioned meetings, that according to the latitude allowed by different authors to species, the genus *Nitella* comprised from 50–76 species (13–16 European), *Tolypella* from 6–7 (4 European), *Lychnothamnus* from 3–5 (2–4 European), and *Chara* from 56–80 (22–28 European). Some of them enjoyed a most extensive, others a very limited geographical distribution. He exhibited a *Chara* from Lake Titicaca, Bolivia, which could not be distinguished from *Chara Baltica;* and as the most recent European discovery, *Nitella ornithopoda*, found by M. de Rochebrune about Angoulême.

CACOMA PINIQUATORUM, De Bory.

This Fungus, which has hitherto been found only about Hanover, has recently been discovered by Professor Ratzeburg near Neustadt-Eberswalde, and is curious because it disfigures the Pine-trees by producing most singular contortions of their branches. It may possibly turn up in other parts of Europe also.

NEW PUBLICATIONS.

The Lichen Flora of the Eastern Borders. By James Hardy. Proceedings of Berwick Naturalists' Club. Alnwick: H. H. Blair.

Contributions to the British and Irish Floras of Musci and Hepaticæ, with additional habitats for some of the rarer species. By David Moore, Ph.D., F.L.S., etc. Dublin: Zool. and Bot. Association.

Gleanings among the Irish Cryptogams. By Benjamin Carrington, M.D., F.L.S., etc. London: W. Pamplin.

The labours of Watson in his 'Cybele Britannica,' and of the various authors of local Floras (works which now deservedly occupy an important place in our botanical literature), have done much to make us acquainted with the distribution in Britain of our flowering plants; but of the geographical distribution of the Cryptogamia almost nothing is known. The monographs of the different families contain, it is true, localities for all, except the generally-distributed species; but it is only by chance that these tell anything of the limits of the species. We therefore gladly welcome any help towards doing for the flowerless, what has been so far done for the flowering, plants.

Dr. Johnstone, in his 'Botany of the Eastern Borders,' gave a catalogue of 77 species found in this district. Mr. Hardy's list contains 244 species. We do not know whether the district is a definitely circumscribed one; we cannot be far from the truth if we consider it as including Berwickshire and the northern part of Northumberland. Mr. Mudd in his 'Manual' gives the number of British species as 495, so that Mr. Hardy's list contains nearly half of them. In determining his species he had the assistance of Dr. Lindsay, Mr. Mudd, and the Rev. T. Salwey, and the use of the late Dr. Johnstone's herbarium, which had passed through the hands of the Rev. W. A. Leighton, and also Mr. Baker's herbarium, which is rich in typical specimens; Mr. Hardy, therefore, in addition to his own familiarity with this family of plants, had the best assistance to ensure the accuracy of his list. The critical remarks appended to many of the species attest the careful and accurate observation of the author.

Dr. D. Moore in his 'Contributions' records the discovery of several species, till then unknown in Britain. These are *Orthotrichum Sturmii*, Hoppe; *Campylopus polytrichoides*, De Not.; *Sarcoscyphus Funckii*,

Nees; and *Leptogium Moorii*, Hepp. He also notices the finding of several rare species on the occasion of visits to the two extremes of Ireland—the Giant's Causeway and the Killarney district.

It is to this last locality that Dr. Carrington's paper refers. The principal object of his six weeks' visit was to examine and collect the *Hepaticæ*, and his catalogue of this family is the most important portion of his paper. The district had been frequently visited and carefully searched by Mackay, Wilson, Taylor, D. Moore, and others, yet many novelties were reserved for Dr. Carrington. These he here describes, and having forwarded specimens to Dr. Gottsche, they are published with illustrative figures in the two last decades (xxiii. and xxiv.) of Rabenhorst's 'Hepaticæ Europææ.' His catalogue contains no less than 104 species, a large number, considering that the most recent published list of British species consists of only 132. This abundance of the moisture-loving Liverworts is owing, no doubt, to some extent, to the equability of the climate, but chiefly to its extreme humidity; the warm air, laden with the vapour of the Gulf stream, meets here in the mountains of Kerry its first barrier. And to the same cause Killarney owes its chief Fern treasure, *Trichomanes radicans*, Sw., a plant speedily disappearing, from the rapacity of fern-collectors, whose money is a strong reason for the native guides rooting up every frond they can find. It is strange that while disappearing here, we should have to record its discovery lately in Cumberland and in Wales, and this month also in Scotland!

Dr. Carrington supplies also lists of the Lichens and Mosses which he met with; many of them rare and interesting, and some of them new. These novelties, as well as two contained in Mr. Hardy's paper, will be found in another page of this Journal.

MISCELLANEA.

The Chinese Date Plum Acclimatized in New South Wales.—The Chinese Date Plum (*Diospyros Kaki*, or more probably *lobata*), a fruit of excellent flavour, indigenous to China, may now be considered acclimatized in New South Wales. It is a handsome tree, with wide extending branches, full twenty feet in height, and now growing and bearing a profusion of fruit in the garden of Mr. Guilfoyle, at Double Bay, Sydney, by whom it has been in-

troduced and brought to perfection. I am informed that the tree has this year produced upwards of 250 fruits, and about 18 still remained on the tree when I visited it. The tree in this garden is rather more than five years old, and is composed of two stems running up from the main trunk. It commenced to bear fruit when two years old. It assumes a beautiful appearance early in the fruiting-season, when its large dark-green foliage is in agreeable contrast with the rich orange colour of the fruit. The flowers are whitish, and slightly fragrant. The tree is deciduous, and only bears one crop of fruit yearly during the months of April and May, and becomes more valuable to the cultivator, as the fruit ripens only a few at a time, enabling a supply to be kept up during those months of the year when fruits for the dessert are scarce, and previous to the supply of oranges. I have seen this fruit in China, but those I observed and tasted in that country were smaller in size, and externally of a bright red colour; as there are several varieties, the size and colour may vary, but the flavour of those produced both in China and this colony were equally good. The colour of those grown in the colony is an orange-red, and when seen pendent from the tree resemble the blood-oranges of Malta, but when viewed closer, may be compared to a large tomato. The bark of the tree is astringent, and the fruits possess much acidity before arriving at maturity. When alluding to the fruits of China, in my 'Wanderings,' I observed: There is another fruit, of which there are several varieties; it is the *Diospyros*, or Chinese date plum, the Kaki of the Japanese, but is named Tzee by the Chinese. One of the varieties is designated by the Chinese, Ngnow-Sum-Tzee, or Bull's-heart *Diospyros*, and resembles in external appearance a tomato, except in being of a larger size. When it is divided it is found to contain a yellowish semitransparent pulp, not unlike a plum, both in flavour, appearance, and consistence, and contains several oblong brownish seeds. The outer skin has a very disagreeable astringent taste, and it would always be desirable to separate it with the finger in the centre, when eaten, in preference to using a knife. Another variety I noticed in China is much smaller, oval, about the size of a date, of a bright crimson colour, and is named by the Chinese, Kai-Sum-Tzee, or Fowl's-heart *Diospyros*. In taste it had a mawkish sweetness, and was not equal to the other variety in flavour. One species I observed very abundant at Manila, and which might also be introduced into this colony; it is the Mabola (*Diospyros Mabola*), and is indigenous to the Philippine Islands. The fruit is seen in profusion in the markets during the season, and of very agreeable flavour. The *Cargillia Australis*, or black plum, so common in the Illawarra and other districts of New South Wales, belongs to the same Natural Order as the *Diospyros*; the fruit, of a dark-purple colour, is beautiful to the eye, although not eatable, but it may be improved by cultivation or by being planted in particular soils; for a gentleman who found the fruit growing to a large size in the Port Macquarie district informed me that they were of very agreeable flavour. The tree bearing this recently acclimatized fruit (*Diospyros Kaki*) belongs to the Natural Order *Ebenaceæ*, which consists of ornamental and highly valuable timber-trees, and many of them, like this, bearing edible fruits. Among the species is one affording the ebony

of commerce (*D. Ebenus*); another, the beautiful kalumander-wood (*D. hirsuta*) of Ceylon, so much used as an ornamental wood for workboxes, writing-desks, etc.; also the Coromandel ebony (*D. melanoxylon*) and the bastard ebony of Ceylon (*D. Ebenaster*). A European species (*D. Lotus*) produces the famous fruit which, according to the ancient romancers, caused oblivion. It is a native of Italy; and another species (*D. Embryopteris*, or *glutinosa*), a native of India, bears a fruit so glutinous as to be used in that country for paying boats. The whole of these may be introduced with advantage into New South Wales.—GEORGE BENNETT, M.D., F.L.S.

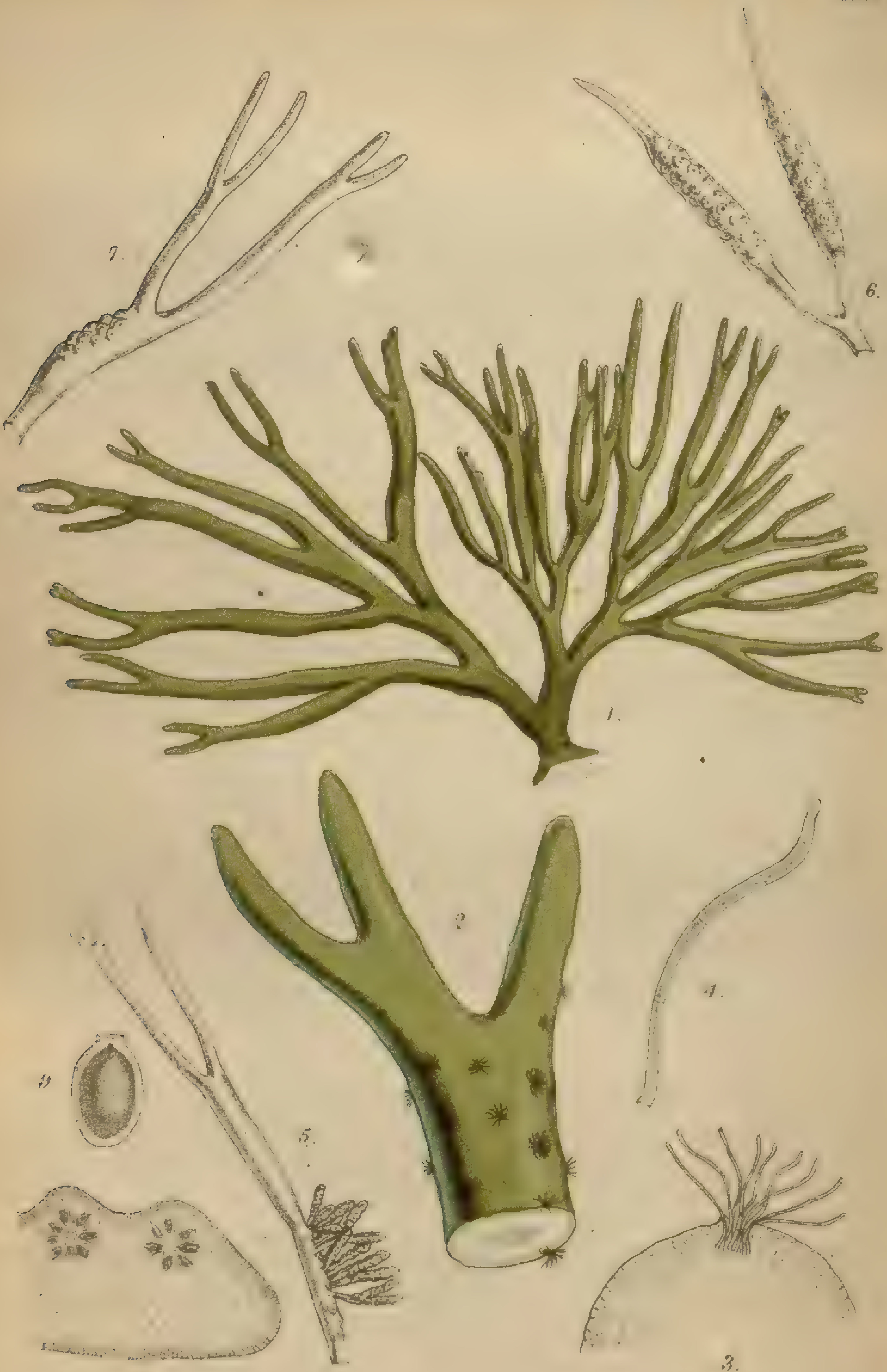
BOTANICAL NEWS.

Dr. Rabenhorst, whose Cryptogamic Flora of Saxony, etc., was noticed by us a few weeks ago, is now preparing a Cryptogamic Flora of the whole of Europe, the publication of which will soon commence.

Sprengel's herbarium, valuable to some public collection on account of the number of ill-described and wrongly-named specimens which the author of the 16th edition of the 'Systema Vegetabilium' has made, has been entirely dismembered, and sold in small portions to different individuals and institutions.

The last meeting of German naturalists and physicians at Stettin was ill-attended. In the botanical section there were, besides Professor A. Braun, Dr. Schultz-Bipontinus, Professor Hartig, few men of note, and little of importance was brought forward beyond what we have given in another part of our Journal. Prof. Münter reported that an herbarium, collected by Rauwolff during the years 1560–63, had turned up at Leyden, bearing record years older than that by the same botanist mentioned by E. Meyer (*supra*). Dr. Hildebrand communicated his results respecting the fructification of Orchids. The ovules of all Orchids during anthesis are undeveloped. The degree of development is different in different species. It is only in consequence of the fecundation of the stigma that the germen begins to swell, and the ovule to develope, and this is effected without a direct connection of the ovule by the pollen-tubes. Dr. Jessen spoke on the phylotaxis of Grasses, and endeavoured to show that the Grasses were Dicotyledons. This hypothesis was strongly controverted. Dr. Schultz-Bipontinus read an interesting paper on the "Vegetable Gold," an acid extracted from the root of *Trixis Pipizahuac*, Schultz-Bip., a Mexican Composite plant, and looking very much like gold-dust. The first notice of this singular production was published by Dr. Seemann in the Proceedings of the Linnean Society. Professor Münter discusses the term *prothallium*, and claims the *prothallium* of Ferns as his discovery. Professor A. Braun explained that there existed only one kind of simple inflorescence, and that all others were formed by a composition of it.

Tab 12.



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FUCUS DISTICHUS, *Linn.*, AS AN IRISH PLANT.

By William Carruthers, Esq., F.L.S.

(Plate XII.)

This interesting addition to the *Fuci* of the United Kingdom was noticed in this Journal (page 283), under the name of *Fucus furcatus*, Ag.; subsequent and more careful examination has, however, shown that it is a Linnean species found in northern Europe, but hitherto not noticed nearer our shores than the Faroe Islands. It was discovered by Professor Harvey and N. B. Ward, Esq., on the 19th of last July, at Kilkee. They found it growing very plentifully near low-water mark, on the perpendicular western face of the Duggerna rock, the face of which is exposed to the Atlantic. It occurred in the greatest abundance, forming a beautiful fringe on a narrow ledge three or four feet from the base of the rock; and it probably occurs on other parts of the western shore of Ireland; but these two eminent botanists had not, when they discovered it, time for further exploring a coast which is not altogether unattended with danger.

The following descriptions have been drawn up from a large series of Irish specimens in the herbaria of the British Museum, N. B. Ward, Esq., and Mrs. Gray, some of which were communicated by Professor Harvey. The Irish plant differs somewhat from the published descriptions of the species. The stipes in our specimens is short and cylindrical, whereas it is described by Agardh and Turner as filiform, and about the thickness of a sparrow's quill, and it is so figured in 'Flora Danica' and in Turner's 'Fuci.' This peculiarity in the Irish plants might, however, be expected from the position in which they occur, exposed as they are to the full force of a very stormy ocean, just as the remarkable collection of phænogamous plants made by Mr. Ward on the rocks above, exhibit strange adaptations to the conditions under which they had to strive for existence. The most striking peculiarity, however, in the Kilkee plants, is the form of the receptacle, which differs from the published descriptions (except that of Lyngbye) and all the figures, as well as from the Newfoundland plant in the Herbarium of the British Museum. The receptacle is obviously wider than the segment which it termi-

nates, it is always broadest below, and tapers gradually in a slender acuminate barren apex.

In size and habit *F. distichus* is not unlike *F. canaliculatus*, Linn. but it belongs to the restricted genus *Fucus*, which is separated from *Fucodium* by the presence of a midrib; it has in this respect closer affinities with *F. vesiculosus*, Linn., and *F. Ceranoides*, Linn., but its size and habit, at least in the British specimens, are very different.

Fucus distichus, Linn. Stipes short, cylindrical. Frond repeatedly dichotomous, linear, without air-vessels, flat and costate below, terete above; margin entire. Receptacles terminal, lanceolate-acuminate, slightly compressed, generally in pairs.

F. distichus, *Linn. Syst. Nat.* ii. p. 716; *Turner, Fuci*, i. p. 7. t. 4; *Lyngbye, Tent. Hydro. Dan.* p. 6. t. 1, C; *J. Ag. Sp. Alg.* i. p. 209; *Harvey, Nereis Bor. Amer.* p. 69.

F. linearis, *Fl. Dan. t.* 351 (*excl. syn. Huds.*).

F. filiformis, *Gmel. Hist. Fuc.* p. 72. t. 1 A. f. 1.

F. furcatus, *ante*, p. 283.

Hab. On the perpendicular western face of Duggerna rock, Kilkee, Ireland (*Harvey* and *N. B. Ward !*).

Geog. Dist. Atlantic shores of Europe, Greenland, and Newfoundland.

Root a conical expansion, a quarter of an inch or more in diameter. *Stipes* in the Irish specimens short and cylindrical. *Frond* somewhat smaller than in foreign specimens, two to four inches long, repeatedly dichotomously forked, flat, and when fresh, with a distinct midrib or longitudinal thickening, and a narrow web on either side in the older portions of the plant; the younger branches are nearly cylindrical, and the barren summits are blunt; the margin is very entire. The frond is without air-vessels, but has scattered over its surface a number of minute pores, from which issue several short simple filaments composed of about four elongated cells. *Receptacle* generally terminal in pairs, lanceolate-acuminate, considerably wider than the segments, which support it, broadest at the base, gradually narrowing upwards, and terminating in a produced acuminate barren point. Sometimes only one of the forked branches bears a receptacle, the other continuing to grow, and branch. Some plants present also a receptacle, which is occasionally lateral, on the older portions of the stem below the branchings. There seems a tendency to a viviparous condition; one plant in Mrs. Gray's Herbarium

shows several of the older receptacles, from which little colonies of young plants are springing.

We transcribe, for the sake of comparison, from the 'Species Algarum,' vol. i. p. 209, Agardh's specific description:—"*F. distichus*, stipite filiformi in frondem costatam dichotomam evesiculosam angustissime linearem integerrimam abeunte, receptaculis subsimplicibus geminis elongato-linearibus compressis."

Explanation of Tab. XII.

Representing *Fucus distichus*, Linn., from specimens collected by Professor Harvey and Mr. N. B. Ward, and supplied by Mrs. Gray.—Fig. 1. The entire plant. 2. A frond. 3. One of the pores of the fronds with the filaments. 4. One of the filaments issuing from the pores. 5. A proliferous receptacle. 6. Terminal receptacles. 7. Inferior lateral receptacle. 8. Cross section of receptacle, showing two conceptacles cut open, containing parietal spores. 9. A spore. Figs. 3, 4, 8, and 9, magnified.

SAGINA NIVALIS, *Fries*, DISCOVERED IN SCOTLAND.

By Hewett C. Watson, Esq., F.L.S.

Mr. Boswell Syme has shown to me a specimen of this arctic plant, which was picked on Ben Lawers, in Scotland, several years ago, by Professor Balfour. Other examples are said to have been gathered at the same time; and their special locality is supposed to have been at that part of the hill where the *Alsine rubella* is found. I believe this to be the only reliable locality for true *Sagina nivalis* in Scotland; and on present knowledge it will stand as the extreme southern limit for the species, which occurs also on the Dovre, in Norway.

In the third edition of the 'Manual of British Botany,' a plant found by Mr. Backhouse on Glass Mhiel, in Forfarshire, was mentioned very doubtfully as *Sagina nivalis*. The allusion to that plant having been expunged from subsequent editions of the 'Manual,' we may conclude that Professor Babington had afterwards decided against the correctness of the name.

In the 'British Flora,' by Hooker and Arnott, edit. 8, the name of *Sagina nivalis* is bestowed upon something found in the Isle of Skye and on the Clova Mountains. I presume that to be simply a misnomer, since the only character to distinguish the plant so called, as a variety of *Sagina subulata*, is conveyed in the expression "almost quite

glabrous." I do not see that *Sagina subulata*, if almost quite glabrous, would thereby become *Sagina nivalis*.

November 10, 1863.

HYPNUM ABIETINUM, *Linn.*

By William Mitten, Esq., A.L.S.

Reading in the October Journal the notice of Brewer's 'Flora of Surrey,' and seeing there the observation that *Teucrium Botrys* grows associated with *Hypnum abietinum*, I was thereby reminded of my having some years ago gone to Reigate Hill expressly to see this Moss in a living state; Dr. H. M. Holman, who published a list of Reigate Mosses in one of the earlier numbers of the 'Phytologist,' having undertaken to show me where and how it grew, for I must admit that on a former visit to the same hills I had not been able to find the Moss, although I knew it should be there. My attention was, however, at that time drawn away from the chalk hills by the variety of interesting things I was finding on the sandy soils below; of these, *Mnium stellare*, Hedw., was one. On my second visit there was no difficulty in finding the *Hypnum*, but I was disappointed with the specimens, my previous idea of the species having been taken from Continental and Scottish specimens, which give the notion of a neat and even foliaged Moss. The Reigate specimens, instead of corresponding in these particulars, were dull green, and entirely wanting in that smooth outline and yellowish-green colour so evident in those from other localities. Further examination only tended to show that there was a certain amount of difference between these forms, but which was the one that was found at Hinksey, near Oxford, and mentioned by Bobart, and afterwards by Dillenius, who is the authority for the locality, it was then impossible to ascertain; for although Dillenius's figure fairly represents the same form as that found on the sands of Barrie, it seemed unsafe to trust the figure alone, and after examination of all the specimens obtainable the matter was given up, except that the differing forms were placed in separate sheets to await further light. Several years after this, Mr. Carruthers called my attention to, and kindly showed me, Buddle's Herbarium in the British Museum, and amongst the Mosses, all now looking as fresh as if gathered yesterday, was a

specimen of *Hypnum abietinum* without locality; but this Herbarium was known to Dillenius, and is mentioned by him, therefore it is a fair conclusion that the specimen is his form, and no other locality having been named, it may have come from the original station. The name *abietinum* it seems useless to attempt to trace beyond Bobart, who supposed it to be C. Bauhin's "Muscus abietis facie;" but after Dillenius's time it has been definitely fixed by Linnæus and Hedwig to the smooth form, having, as most authors agree in saying, branches with leaves teretely imbricated, the cauline leaves cordate, acuminate, and the branch-leaves ovate. This form is found on the sands of Barrie, on the sands on the coast at Pembray, and I have it from Norway with fruit, *Blytt*; from *Funk*, No. 196, also in fruit; from Switzerland, *Sir W. J. Hooker*; from *Haller*, No. 1762; from the Pyrenees, *Spruce*, No. 1; from Chambéry, in fruit, *Mr. Woods* and *De Notaris*; in 'Mougeot et Nestler,' No. 226, from British North America, in fruit, 'Drummond,' No. 216, and sterile, *Bourgeau*. Most authors say it is common, but I have never seen it in Herbaria from more than a very few stations, and no specimen was contained in the set of the *Stirpes Normales* of the 'Bryologia Europæa,' in my herbarium. So far as I have observed, the British specimens are all female.

The Reigate Moss may thus be characterized:—*Thuidium hystricosum*, foliis caulinis e basi latiore cordata acuminatis lanceolatis falcato-curvatis subsecundis, rameis ovato-lanceolatis cellulis ovoideis, cæterum *T. abietino* conveniente.

HAB. Box Hill and Reigate Hill, in Surrey; Morant's Court Hill, near Sevenoaks, Kent, on the same range of hills, throughout which it probably occurs; Hampshire, Mr. A. O. Black; Barton Mills, Suffolk, Mr. Borrer; near Genoa, De Notaris; fruit unknown.

The proportionally longer, loosely appressed, or variously curved leaves of this Moss easily distinguish it without recourse to the microscope, but with its aid the leaf-cells are seen to be more generally of an ovoid outline than in *T. abietinum*, which has them for the most part round or nearly so; in the nerve, margin, and degree of papillation, there seems to be not any appreciable difference.

Having thus called attention to this not very pretty Moss, others may be able to trace its existence in new localities, and some intermediate state may connect it with the older form; but I have not been able to find any such in any of the collections to which I have had access.

REMARKS ON THE YIELD OF QUININE IN THE LEAVES OF CHINCHONA PLANTS.

By Dr. Anderson, F.L.S.

Communicated by Clements R. Markham, F.R.G.S.

[Dr. Anderson's communication is interesting, as confirming to a certain extent the existence of alkaloid in the leaves of *C. succirubra*. The process adopted by Dr. Anderson is varied somewhat from that which he describes as adopted by Dr. Simpson and himself in June, 1863, and is more satisfactory, inasmuch as the crystals then obtained, and appearing as a whitish spot on the glass, might have resulted from the addition of *carbonate of soda* to bring back the solution (acidulated with *sulphuric acid*) to a perfectly neutral condition. In this way *sulphate of soda* would be formed, which might deceive an observer by its crystallization on glass in the very small quantities named. Moreover, Dr. A. informs us that "at this stage the process was arrested, notwithstanding the removal of colouring matter by animal charcoal." The present paper certainly gives very strong grounds for confirmation of the existence of alkaloids in the leaves, but also shows them to be in a state so much implicated with other matters as not to be so easily purified as appeared on the first essay referred to, published in a Supplement to the 'Calcutta Gazette,' August 15, 1863, and reprinted in the 'Pharmaceutical Journal' for November. Our impression is not favourable to the manufacture of quinine from the leaves, as the very small percentage of quinine (which we do not think exceeds what is mentioned in Mr. Howard's analysis), and the complication of this small amount with tannin, etc., would probably enhance too much the price of the product.—Ed.]

I have a qualitative analysis going on now of the Chinchona leaves, and so far as I have got, there is evidently a considerable amount of quinine present. It was precipitated from an "acidified" alcoholic fluid on the addition of carbonate of soda. The process I am following is a long one. First, digestion of about ½ lb. of dried leaves in concentrated acetic acid, with some details of squeezing: evaporation to dryness on the water bath. Second, solution in alcohol by boiling, and then the residue of the dry residuum not taken up by the alcohol was treated with alcohol and acetic acid. The mixed liquids filtered hot and strained, then evaporated to almost dryness; the residuum then broken up in distilled water: then slight alkaline reaction was brought about by carbonate of soda, which resulted in an abundant grey flaky precipitate. I am now evaporating this, and as the liquor got heated, the precipitate dissolved freely; and as the liquor diminishes, a crystalline scum has formed on the top of the hot liquid: the liquid is in

tensely bitter. I shall carry it on until I get a clear solution for testing for quinine and chinchonine; one or other, or most probably both of which are present in considerable proportions. A quantitative analysis of the leaves would be invaluable, as it would decide the question which is constantly asked of me, "Can we remuneratively get quinine from the leaves?" It is important to note that the quinine evidently exists in the old leaves—those that are about to fall off. The Chinchona (at least *C. succirubra*) belongs to that large class of tropical plants that are half-deciduous; that is, they retain their leaves throughout their period of rest, and throw them off at the commencement of the growing season, so that the tree is never absolutely bare, but looks only much thinned of its leaves for six or eight days, and is in full leaf again in about a week. We might pick the leaves, then, just as the growing season is returning, and do no damage. The Chinchonæ are not evergreens in the sense that Myrtles, Laurels, etc., are.

My largest plant at Darjeeling is a plant of *C. officinalis* I got from Ceylon in the end of January: on the 15th of August it was thirty-six inches high. The largest *C. succirubra* was two inches shorter. There were in August 7000 Chinchona plants at Darjeeling.

Calcutta Botanic Gardens, August 22nd, 1863.

IS *HUTCHINSIA ALPINA*, *R. Brown*, A BRITISH PLANT?

By the Rev. W. W. Newbould, M.A., F.L.S.

Will botanists visiting Ingleborough early in spring* endeavour to answer this question? Two specimens of it have been shown me by Mr. Carruthers in a collection of British plants, which is apparently the one bequeathed to Sir J. E. Smith in 1805, by Mr. Arthur Bruce, of Ballochmyle, Ayrshire (see Sir J. E. Smith's Memoir, vol. i. p. 434), and afterwards long in the possession of the Linnean Society; they are labelled, "*Lepidium petræum*, Ingleborrow, Mr. M'R[itchie]," and seem to have been gathered late in the last century, if we may judge from the dates of other plants accompanying them. It cannot be safe to consider the Yorkshire station an error, when it is remembered that both the calcareous soil and altitude which the plant requires are found

* This plant flowers in Germany in April and May, according to Koch's 'Synopsis.'

in the Ingleborough district, and that its Continental distribution is not opposed to its being found with us; but it is desirable to have modern confirmation of its occurrence before it can be with certainty called a British plant.

As *H. alpina* is described by Reichenbach, Koch, Godron, Boreau, and others, it is only necessary to add that its unbranched stem and large petals clearly distinguish it from *H. petræa*, which it does not resemble even in aspect.

ESSAY ON THE METAMORPHOSIS OF PLANTS.

BY J. W. VON GOETHE.—1790.

Translated by EMILY M. COX; *with Explanatory Notes by* MAXWELL T. MASTERS, M.D., F.L.S.

(*Concluded from p.* 345.)

(PLATE XI.)

X. *Of the Fruit.*

74. We shall soon perceive that the fruit is of like origin with the previous organs, and subject to the same laws. We here speak more particularly of those seed-vessels which enclose so-called covered (angiospermous) seeds, or, more correctly, which are formed for the development of a larger or smaller number of fertilized seeds within them. It will be easy to show that these seed-vessels may be explained by the nature and organization of those parts of the plant which we have already considered.

75. Here again retrogressive Metamorphosis reminds us of Nature's law. In Pinks, for example, the very irregularity of which makes them such familiar and favourite flowers, it not unfrequently happens that the capsule assumes the appearance of sepals, and the styles shorten. The capsule of the Pink has even been transformed into a true and perfect calyx; little remnants of the styles and stigmas remaining attached to the tips of the divisions, whilst in the centre of this second calyx, a more or less perfect corolla was developed instead of seed.*

* See § 105.

1.
2.
a
b.
2.
c
c.
d
3
4
5
a.
b.
8a
8.
7
6.
a
b
9.
9a

76. Nature herself, in instances of regular and constant occurrence, has further disclosed to us in manifold ways the fruitfulness concealed in the leaf. Thus in the Lime, a leaf (in rather an altered state it is true, but still easily recognized) produces from its midrib a little stalk with a perfect blossom and fruit. Still more remarkable is the manner in which the blossom and fruit are situated on the leaf, in *Ruscus*.*

77. Yet greater, we may even say monstrous, is the inherent fruitfulness of the fronds of Ferns, which by an internal impulse, and perhaps independently of any definite operation of stamens and pistils,† develope, and scatter around, innumerable seeds (spores), or rather, germs capable of growth; one single frond rivalling a wide-spreading plant, nay, a large branching tree, in fruitfulness.

78. If we keep in view the observations which have now been made, we shall not fail to recognize the leaf in all seed-vessels, notwithstanding their manifold forms, their variable structure, and different combinations.‡ Thus, for example, the pod of a Leguminous plant would be a simple leaf folded together, with its margins united. The husks (*Schoten*) would consist of several leaves grown one upon another. Compound pods (capsules) might be explained as composed of several leaves united round a common centre, joined together at their margins, but open towards each other on the inner side. This is obvious enough

* The illustrations of this paragraph are not well chosen. In the case of the Lime-tree, the flower-stalk is simply adherent to the bract for a portion of its length, while the so-called leaves of *Ruscus* are more properly considered as leaf-like branches. Some, however, contend that the leaf-like organs, on the margins of which the flowers are borne, in *Xylophylla*, are truly to be regarded as leaves, and not as phylloid branches. In *Bryophyllum calycinum*, *Nymphæa micrantha*, and many Ferns, the leaves give origin to a great number of buds, by which the plants may be propagated.

† The recent researches of Nägeli, Suminski, and others, have proved the existence of organs analogous to stamens and pistils (antheridia and pistillidia) in Ferns, as well as in other so-called Cryptogamous plants, and have further shown that no new spores can be formed until after the contents of the pistillidium have been fertilized by the spermatozoids formed in, and emitted from, the antheridia.

‡ This principle is made by De Candolle the foundation of a system of classification of fruits and seed-vessels, which is in many respects the simplest and best that has yet been proposed. The more recent researches of Lestiboudois completely confirm the opinion that the carpels are homologous with leaves. (Ann. Sc. Nat. Bot. 1855, p. 242.) The double-flowered Cherry has pretty constantly its carpels existing in the form of small leaves, and the records of teratology afford numerous instances of a similar foliaceous condition of the carpels. (Moquin-Tandon, 'Tératologie Végétale,' p. 204; Brongniart, 'Archives du Musée,' tom iv. p. 43, etc. etc.) That the pistil may sometimes be formed from the dilated extremity of the branch was not suspected in Goethe's time.

when after the ripening of the seed the capsule bursts asunder; each part then having the appearance of an open legume or pod. It is also shown by different species of the same genus; for instance, the capsules in *Nigella orientalis* consist of pods partially united and collected round an axis, while in *N. Damascena* their union is complete.*

79. This resemblance to the leaf is most difficult to discern when nature produces the seed-vessel either in a soft and succulent, or in a hard and woody state; but it will not elude our observation when we have once learnt to trace it through all its transitions. It is sufficient here to indicate the general idea, and by a few examples to show nature's unity of design. The manifold varieties of the seed-vessel will afford us matter for future and deeper consideration.

80. The connection of the seed-vessel with the preceding organs is also shown in the stigma, which in many instances is situated immediately upon the germen and is inseparably united with it. We have before pointed out the relation of the stigma to the leaf, and will here mention but one more instance, namely, the Double Poppy, in which the stigmas are changed into delicate-coloured petals.†

81. The last and greatest instance of expansion effected by the plant in the course of its growth, is seen in the fruit, which is often great, nay monstrous, both in internal power and in outward form. Since, after fructification, it generally increases in size, it would appear that whilst the seed, now in a more perfected state, draws those juices from every part of the plant which its own growth demands, they become centred in the fruit; by which means its vessels are nourished, enlarged, and often swollen and expanded to the greatest extent. That refined gases have a great share in this, may be inferred from what has been previously stated; the fact that the distended pods of the bladder-nut (*Colutea arborescens*) contain pure gas, has been established by experiments.‡

* Wolf. N. Comm. Acad. Petrop., *op. cit.*, expresses precisely the same opinion as to the nature of the seed-vessel.

† See Linn. 'Prolepsis,' § 9. In the 'Gardeners' Chronicle' of August 18th, 1855, there is a figure of a *Nymphæa*, in which, in addition to other singular changes, the stigmas are replaced by leaves. In *Stigmatophyllon* and many *Malpighiaceæ*, as well as in some other plants, the stigmas are very like leaves or petals (see tab. xi. fig. 7).

‡ If by pure gas, oxygen is meant, the fact is very doubtful; latterly, however, Matteucci has detected carbonic acid gas in these pods; but the presence of either of these gases would hardly afford any assistance towards explaining the enlargement of the seed-vessel.

XI. *Of the immediate Covering of the Seed.*

82. We find the seed, on the contrary, in the highest degree of contraction, but internally perfect. It may be perceived, in various seeds, that transformed leaves constitute their first covering, that they more or less adapt this covering to their shape, and in most instances that they have the power of closely attaching it and of entirely changing its form. Having seen above, that many seeds are developed in and from a single leaf, we need feel no surprise that a single embryo should clothe itself with a leafy covering.*

83. We see in many winged seed-vessels traces of such modified leaves imperfectly fitted to the seed,—in those, for instance, of the Maple, the Elm, the Ash, and the Birch. The Marigold affords us a very remarkable example, in its three circles of differently-shaped seeds (fruits), of the manner in which the embryo gradually contracts a covering of larger dimensions than itself, and closely adapts it to its own form. In the outer series the seed-vessel still retains a shape resembling that of the leaflets of the involucre, except that the rudimentary seed occasions a strain on the midrib, and curves the leaf, the inner curved surface being longitudinally divided by a membrane into two parts.

In the next circle a still further change takes place; the little leaf is both narrower and shorter, the membrane has entirely disappeared, and the rudimentary seed is more plainly shown at the back, on which moreover little excrescences are now perceptible; these two circles appear to be either not at all, or imperfectly fructified. In the third circle the curved shape of the seed is undisguised, the covering fits closely, and all its ridges and excrescences are complete.† Here we see a fresh

* For instances of the reversion of seeds or ovules to leaves, see Lindley, 'Elements of Botany,' p. 88; Moquin-Tandon, 'Tératologie Végétale,' p. 205, etc.

It can hardly be said that the morphology of the coats of the ovule or seed is yet understood. While there is much evidence to show their foliar origin, there is also much in favour of their intrinsic axial nature.

See A. Braun, Mém. sur les Transform. de l'Ovule Végétale, etc.; Ann. Sc. Nat. 1860, tom. xiv. 4me série. Hooker on ovule of *Welwitschia*, Trans. Linn. Soc. vol. xxiv. p. 27; Griffith in Lindl. Veg. King. p. 143.

† In the Marigold the achenia of the outer or ligulate florets are, as Goethe describes them, polymorphous; his account of them, though strictly correct in the main, would not be very intelligible to botanists not familiar with the plant. The fruits in question are in two or three rows, frequently surmounted by a beak, all more or less curved, and the outer ones especially provided with three leafy wings, two projecting from the margins, and the third from the middle of the inner surface, which it "divides into two parts." In *Tripteris*, a South African genus closely allied to *Calendula*, the fruits are even more decidedly three-sided and three-winged.

instance of the contraction of an expanded leaf-like organ, occasioned too, no doubt, by the internal strength of the seed, just in the same way as we have seen the petal contracted by means of the anther.*

XII. *Retrospective and Progressional.*

84. Thus far, then, we have carefully followed nature's footsteps; we have traced the outward form of the plant through all its transformations, from the period of its development from the seed till the seed is produced anew, and without pretending to investigate the hidden springs of impulse in nature's operations, we have directed our attention to the outward indications of those powers by which one and the same organ is gradually transformed. That the thread of the argument might be closely followed up, we have throughout spoken only of annual plants; we have simply observed the transformation of the leaves developed at the nodes, and from them have deduced every variety of form. But it will now be requisite, in order to give due completeness to this inquiry, to speak of the buds, which are inconspicuously situated at the base of each leaf; which, under certain circumstances, are developed, and under others seem entirely to disappear.

XIII. *Of Buds and their Development.*

85. Every node is endowed by nature with the power of producing one or more buds. These are developed in proximity to the accompanying leaves, which seem to prepare the way for and bring about the formation and growth of the buds.

86. In the successive development of one node from another, in the formation of a leaf at each node and of a bud adjacent to it, consists the primary, simple, and slowly-progressing process by which vegetable life is propagated.

87. It is well known that such a bud shows great similarity in its operation, to the ripe seed; and that, of the two, the entire form of the future plant may be often better recognized in the bud than in the seed.

88. Although the point at which the root will be developed is not so

* In this and the preceding section there is a little confusion between true seeds and those seeds to which the pericarp is, when ripe, inseparably adherent; these latter were not distinguished from ordinary seeds in Goethe's time. The argument is not affected by this confusion of parts.

easily detected in the bud, it is nevertheless present no less than in the seed; and, especially under the influence of moisture, the root is easily and rapidly produced.

89. The bud requires no cotyledons, because it is connected with the parent plant (now in a state of complete organization), and receives nourishment from it so long as this connection lasts; when separated from it, nourishment is supplied either by the plant on which it is grafted, or if planted in the soil, by roots which are immediately formed.

90. The bud is composed of nodes and leaves more or less developed, by means of which the plant continues to increase in size. Thus we may consider the lateral branches which arise from the nodes, as distinct little plants established on the parent, in the same way as the parent plant itself is established in the soil.*

91. The resemblance and the difference which exist between the seed and the bud, have been often, and especially of late, the subject of such able and exact investigations, that we can but appeal to them here with unqualified approbation.†

92. We will but state what follows. Nature makes an obvious difference in highly-organized plants between buds and seeds; but if we descend to plants of a simpler structure, the difference between them is imperceptible to the eye of even the most acute observer. There are unequivocal seeds, and there are unequivocal propagative buds; but the point is a purely ideal one, at which buds which simply push their way out from the parent plant and separate from it without any apparent cause, become one, as regards their inherent functions, with fertilized and disengaged seeds.

93. Having well weighed these things, we may venture to infer that

* The individuality of the buds seems to have been suspected by Hippocrates, who remarked the similarity between the branch and a small tree,—

'Αλλ' αὐτὸς ὁ κλάδος ἐστὶν ὥσπερ καὶ τὸ δένδρον ἔχει.—*De Natura Pueri.*

The doctrine that a plant is a compound being, a combination of individuals, has been supported in later times by La Hire, Goethe, Darwin, Du Petit Thouars, De Candolle, Gaudichaud, and others; while Sars, Steenstrup, Owen, Forbes, etc., among zoologists, have indicated analogous phenomena in the animal kingdom. These authors consider the formation of a series of buds as a process of vegetative reproduction alternating with, or intervening between, that which is the result of the sexual process. See Owen on Parthenogenesis; Forbes, 'Monograph of the Naked-eyed Medusæ,' p. 87; A. Braun, 'Rejuvenescence in Nature,' Ray Society Transl. 1853.

† Gærtner, 'De Fructibus et Seminibus Plantarum,' cap. 1.

seeds, whilst they differ from the newly-developed bud (*Auge*) in being concealed within a seed-vessel, and from the more mature bud (*Gemma*) in the discernible cause of their formation and subsequent separation from the parent plant, are yet nearly related to the bud at each of these periods.

XIV. *On the Formation of Composite Flowers and Fruits.*

94. We have thus far endeavoured to explain by the transformation of the stem-leaves,* the formation of solitary flowers, and also of those seeds which are produced within a closely adherent covering. It will appear, on a careful examination, that in these instances the (axillary) buds are absent, and that, on the contrary, the possibility of such a development is altogether out of the question. But in explaining Composite flowers and fruits (whether the receptacle be conical, cylindrical, discoidal, or of any other form), we must look to the development of buds for assistance.

95. Now we commonly see stems which, instead of reserving their energy and making a long preparation for the production of a single (terminal) flower, develope blossoms at their nodes, and proceed uniformly in this manner to the very tip. But the phenomenon thus shown is susceptible of explanation by the theory propounded above. All flowers developed from axillary buds are to be regarded as perfect plants, situated in the same way on the parent plant as the parent plant is situated in the soil. But as the juices received from the nodes are in a refined state, the very first leaves of a little branch are much more defined in shape, than the earliest leaves which, in the parent plant, immediately succeed the cotyledons; nay, even the immediate formation of the calyx and corolla may not unfrequently occur.

96. Even the blossoms thus produced from (axillary) buds would have become branches by a more copious supply of nourishment, and in their turn parent-stems to another set of buds.†

97. During the successive development of such blossoms at the nodes, we perceive the same change taking place in the stem-leaves which we before observed during the slow transitional process by which

* Had Goethe written "modification," his theory would not have met with so much opposition.

† The flowers are occasionally more or less converted into branches. See Lindley's 'Elements of Botany,' p. 62; Moquin-Tandon, 'Tératologie Végétale,' p. 366, etc.

the calyx was produced. They gradually diminish in size, till at last they almost entirely disappear; the leaf-form is more or less lost in their diminished state, and they are called bracts. The stem becomes attenuated in the same proportion, the nodes approximate, and all the phenomena before pointed out take place, except that there is no decidedly terminal flower, because Nature has already fulfilled her task at each successive bud.

98. Now when we have well considered a stem thus adorned with a flower at every node, we shall be in a condition to understand a *composite flower;* and the more easily if we remember what was stated above concerning the formation of the calyx.

99. Nature forms a common calyx (involucre) out of a number of leaves which she draws close together and arranges round an axis. With the same strong impulsive growth she developes, if we may so speak, *a stem without an end, producing all its axillary buds simultaneously, and in the form of flowers, which are placed in the closest possible proximity*, each separate floret fructifying its own germen. Nor are the node-leaves always lost in this instance of excessive contraction; in Thistles, (as for instance in *Dipsacus laciniatus*,) the leaflet faithfully accompanies the floret which is developed from the contiguous bud. In many Grasses also, each floret is accompanied by a similar kind of leaflet, called a glume.

100. We thus perceive how *the seeds produced in a composite flower may be considered as true buds, formed and developed by means of the male and female organs.* The examination of the growth and manner of fruiting of various plants will establish this view.

101. This being so, we may easily draw the same inference as to the seeds produced in the centre of a single (non-composite) flower, whether they are enclosed within a seed-vessel, or not.* For the argument is the same, whether a solitary flower encloses a compound ovary, whose united pistils imbibe the fertilizing moisture from the anthers, and convey it to the ovules; or whether a one-seeded ovary is provided with its own pistil, anthers, and corolla.

102. We are convinced that with a little practice it would not be difficult to explain in this manner the manifold forms of fruits and

* In the latter instance Goethe probably had in view the one-seeded achenes of Labiates and Borages, and other plants ranked as *gymnospermous* in his time. See note to § 83.

flowers. All that is requisite is to be able to work out the aforenamed ideas of expansion and contraction, approximation and anastomosis, as easily as we work out rules of algebra, and to know how to apply them in their proper places.* And, as much depends upon the exact observation and comparison of the different gradations through which nature passes, both in the formation of genera, species, and varieties, and in the growth of individual plants,—a series of illustrations exhibiting these gradations, with explanations expressed in botanical terminology, would be both welcome and useful.† We will now adduce two instances of proliferous flowers, having an important bearing upon this theory.

XV. *A Proliferous Rose.*

103. All that we have been endeavouring to grasp by the aid of thought and reason is shown in the clearest manner in the instance of a proliferous Rose. The calyx and corolla are developed and arranged round the axis, but instead of the contracted receptacle with its stamens and styles in the centre, the stem, variegated with green and red, again ascends; and on it are successively developed, unexpanded, dark-red petals of a smaller size, on some of which are visible traces of anthers. The stem goes on growing, prickles appear on it, the *alternate* petals continue to diminish in size, and change at last into stem-leaves, also variegated with red and green; a series of regular nodes is formed, and from their buds small imperfect rose-buds burst forth.‡

104. This same example also affords us a visible proof that, as has been before explained, the outer border of the calyx may be considered as a number of approximated leaves (*folia floralia, bracteæ*); for the calyx here consists of five perfect, compound leaves, of three or five

* "Every plant has its proper vital lines for these vibrations of the metamorphosis, the constructive representations of which lines will make clearly conceivable characters which botanists have only seized in the most fragmentary manner, or have felt obscurely as something indescribable in the habit." (Braun, 'Rejuvenescence,' Henfrey's translation, p. 83.) No plant is more suggestive, or more worthy the attention of morphologists than the *Welwitschia*, described with so much care and acumen by Dr. Hooker in the paper above referred to.

† Goethe's obscure and unscientific phraseology has constituted one of the main difficulties the translator has had to encounter in rendering the essay into English; and moreover it may have afforded a reason for the little inclination scientific men had at first to entertain Goethe's opinions.

‡ Masters, 'On Median and Axillary Prolification in Flowers,' Transact. Linn. Soc. vol. xxiii. pp. 359–481, c. icon.

leaflets, resembling in all respects those which the rose-branches produce at their nodes.

XVI. *A Proliferous Pink.*

105. We have in this proliferous Pink a perfect flower, with a calyx and a double corolla, and in the centre a somewhat imperfect capsule. From the sides of the corolla,* four other perfect flowers are developed, separated from the parent-flower by stalks of three nodes or more in length. Each of these has also a calyx and double corolla, formed not so much from separate (typical) leaves, as from a crown of (typical) leaves, with the petioles united, or rather of a series of (typical) flower-leaves developed around an axis and united on a little branch. Notwithstanding this monstrous development, the filaments and anthers are sometimes present. In some the capsules are produced with their styles, in others the capsule is leaf-like, or rather like a calyx, and contains the rudiments of another double corolla.†

106. In the Rose we have, as it were, a half finished flower, from the centre of which the stem again shoots upwards, bearing stem-leaves as before; in this Pink, with a well-formed calyx and a perfect corolla, and a *capsule situated in the very centre*, we have *buds developed within the circle of the petals*, producing actual branches and blossoms. Thus, both instances lead us to the conclusion, that nature ordinarily terminates the period of growth in the blossom, and so, as it were, closes her account, that by thus preventing the possibility of gradual and indefinite growth, she may arrive at her object by a shorter way in the formation of the seed.

XVII. *Linnæus's Theory of Anticipation.*

107. If I have sometimes stumbled in a path which one of my predecessors, though exploring it under the guidance of his great master,

* *Query*, From the receptacle within the corolla?

† The Pink described in this paragraph seems to be the same as that mentioned by Goethe, in his history of his botanical studies, as having greatly contributed to develope the fundamental idea of the metamorphosis of plants. At § 75 is a good description of the most usual kind of proliferous Pink, of which numerous instances are cited by Moquin-Tandon, 'Tératologie Végétale,' p. 366. M. Gingins-Lassaraz cites, as an illustration of this present paragraph, the case of *Dianthus prolifer*; but the description given by Goethe does not correspond to that flower.

A Pink affected with axillary prolification, and figured in my paper on axillary prolification before cited, seems to resemble closely the one described by Goethe. See also tab. xi. f. 9, 9*a*.

describes as difficult and hazardous;* if I have not entirely succeeded in levelling it, and clearing it of every obstacle for those who come after me, I may yet hope that this endeavour will not be altogether fruitless.

108. It will be proper here to mention the theory by which Linnæus sought to explain the phenomena of which the foregoing pages treat. Things such as those therein discussed, could not have escaped his penetrating eye; and if we are now able to advance, where his progress was checked, we are indebted for this to the many observers and thinkers who have removed obstacles from our path, and overcome prejudices. An exact comparison of his theory with that above propounded, would detain us too long. The scientific reader will easily compare them for himself, and such a comparison must necessarily enter too much into detail, if made intelligible to those who have never considered the subject. We will only point out briefly what hindered Linnæus from making further progress, and prevented his reaching the goal.

109. In the first place, his observations were made on trees;† long-lived plants of a complicated nature. He noticed that a tree planted in a large pot and copiously supplied with water, produced branch after branch for several years in succession, but that if planted in a smaller pot, it speedily produced both flowers and fruit. He perceived that a development, which is generally gradual, may thus be forced to take place at once. He therefore designated this operation of nature by the name of "Prolepsis,"—anticipation,—because the plant appeared to anticipate by six years, the six steps of which we have spoken above. He chiefly explained his theory by the buds of trees, without paying any particular attention to annual plants, else he would have been aware that his theory did not hold equally good with regard to them. For according to his teaching, we must assume that all annual plants were properly intended by nature to be six years in coming to perfection, but that this longer period is suddenly anticipated at the time of blossoming and fruiting, after which they as suddenly wither.

* Ferber, in Præfatione Dissertationis secundæ de Prolepsi Plantarum.

† "Si arbusculam, quæ in olla antea posita, quotannis floruit et fructus protulit, deinde deponamus in uberiori terra calidi caldarii, proferet illa per plures annos multos ac frondosos ramos, sine ullo fructu. Id quod argumento est, folia inde crescere, unde prius enati sunt flores; quemadmodum vicissim, quod in folia nunc succrescit, id natura ita moderante, in flores mutatur, si eadem arbor iterum in olla seritur." (Linn. 'Prolepsis,' § iii.)

110. We, on the contrary, have begun by making observations upon annuals, and an application of the argument to longer-lived plants may be easily made; for an opening bud on the oldest tree may be regarded, in some sort, as an annual plant, although capable of longer duration, and produced from an old stem.

111. The second cause which checked the further progress of Linnæus was, that he regarded the different circles enclosed one within the other in the stem of a plant [namely, the outer and the inner bark, the wood, and the pith], as equally active and essential parts, alike instinct with life; and that he attributed the origin of the flower and fruit to these different rings of the stem, because, like them, they encircle each other, and appear to be developed one from the other.* But these were only superficial observations, which could never stand the test of a closer examination. Not only has the wood within become too hard, but the outer bark, in long-lived trees, is both too hard on the outer side, and too slightly connected with the inner portion of the stem, to be the cause of any fresh development. In many trees it breaks away and falls off, and in others it may be stripped off without any injury to the tree, so that it cannot produce either the calyx or any other living part of the plant. It is in the second bark (*liber*) that all the power of life and growth resides; in proportion as this is injured, the growth of the plant is interrupted; it is this also, as close observation will convince us, which produces the external organs in succession on the stem, or simultaneously in the flower and fruit.† Linnæus only ascribed to it the subordinate office of producing the petals. The important production of the stamens, on the contrary, was attributed to the wood; it is clear, nevertheless, that however durable this portion of the plant may be, which solidification has rendered inactive, it is dead as regards any vital action. But the most important office of all was reserved for the pith; that, namely, of producing the pistils and their numerous seeds. The doubts which have been raised as to the great importance thus ascribed to the pith, and

* Cf. Linn. 'Prolepsis,' § 7, 8. Wolff's account of the development of the flower, in his 'Theoria Generationis,' 1759, is much more in accordance with truth, and, with some slight exceptions, it is amply confirmed by modern observers. To Wolff undoubtedly belongs the merit of being the first to insist on the necessity of examining the development of flowers, and of being the first to give, from actual observation, a clear account of the process.

† See note to § 27. See also Trécul, Ann. Soc. Nat., 3me série, tom. xx. p. 211, and 4me série, tom. iii.

the reasons alleged against it, appear to me weighty and conclusive. The only causes which could have given rise to this notion, are the soft and undefined state (resembling that of pith or parenchyma) in which the pistils and fruit first make their appearance, and their position in the centre of the stem, where we are accustomed to see the pith.

XVIII. *Recapitulation.*

112. It is my wish that this attempt to explain the metamorphosis of plants, may not only contribute something towards the solution of this problem, but may give occasion to further investigations and results. The observations on which it is grounded, which were made at different times, have been collected and arranged by Batsch in his 'Anleitung zur Kenntniss und Geschichte der Pflanzen;'* and it will soon appear whether the step we have taken has brought us any nearer to the truth. Let us now review as briefly as possible the leading points in the foregoing essay.

113. When we consider the indications of vital powers existing in plants, we find them manifesting themselves in two different ways; first, by *growth* during the development of the stem and leaves; secondly, by *reproduction* effected in the flower and fruit. When we narrowly watch the growth of a plant, we see that as it mounts upwards from node to node, and from leaf to leaf, a kind of reproduction is going forward, differing from the *sudden* reproduction effected in the flower and fruit, inasmuch as it is a series of *successive* and distinct developments. This power of gradual growth by the production of buds, is most closely related to that which effects reproduction at once. Under different circumstances a plant may, on the one hand, be forced continuously to produce leaf-buds, or, on the other, to develope the flower. The former result is produced by an accumulation of crude juices, the latter by the preponderance of the subtile powers latent in the plant.

114. The manner in which the two different kinds of reproduction take place, has been indicated by the application of the term *successive* to reproduction by leaf-buds; whilst we spoke of reproduction by the flower and fruit as *sudden*. A plant, whilst it is producing leaf-buds, increases more or less in size, it developes a stalk or stem, the nodes are generally separated by perceptible intervals, and leaves expand in all directions. But, on the contrary, when a plant produces the

* 1 Theil, 19 Capitel.

flower, all the parts become contracted, increase in height and breadth has ceased, and all the organs, now in an extremely contracted state, are developed in close proximity.

115. But whether a plant produces leaf-buds, flower, or fruit, it is still *the selfsame organ* which is carrying nature's laws into effect, though performing different offices, and disguised under different forms.* The same organ which on the stem expands as the leaf, exhibiting every variety of form, is contracted in the calyx, again expands in the petal, and is once more contracted in the stamens and pistils, to expand for the last time in the fruit.†

116. This operation of nature is combined with another, by means of which *different organs are assembled round a common centre*, in a definite number and order, subject however to variation in many flowers, and under certain circumstances.

117. An anastomosis likewise co-operates in the formation of the flowers and fruit, by means of which the delicate organs of reproduction are brought into the closest connection with each other, either through the whole period of their duration, or at least during a part of it.

118. But these phenomena of *approximation*, *centralization*, and *anastomosis* are not peculiar to the flower and fruit; we may perceive something of the same kind also in the cotyledons.

119. Now in the same way as we have endeavoured to deduce all the apparently different organs of a plant, whether producing buds or flowers, from one and the same organ,—namely, the leaf, which is usually developed at the nodes, we have further ventured to refer to the same origin, the fruit (seed-vessel), within which the seeds lie safely enclosed.

120. It was obviously necessary to adopt some general term by which to indicate the one organ which we see metamorphosed under so many different forms, and which we could also employ in comparing these variations with each other. The thing to be now aimed at is to keep habitually in view the two contrary directions, if we may so speak, in

* Dr. Dresser's opinion that the sepals, petals, etc., are often modifications rather of the petioles than of the laminæ of leaves, though undoubtedly correct in many instances, by no means militates against the truth of Goethe's propositions. See Dresser, 'Rudiments of Botany,' pp. 277, 299.

† See Wigand, 'Kritik und Geschichte der Lehre von der Metamorphose der Pflanzen,' 1846, p. 118.

which these variations are developed. For we may say with equal truth that a stamen is a diminished petal, or that a petal is an expanded stamen; that a sepal is a diminished stem-leaf in a more refined condition, or that a stem-leaf is a sepal in a state of expansion occasioned by crude juices.

121. Thus also it is immaterial whether we speak of the stem, as the flower and fruit in a state of extension, or whether, as above, we regard the flower and fruit as a shortened stem.

122. At the end of this treatise I have taken into consideration the development of *buds*, and have endeavoured to explain by their means the nature both of composite flowers, and of those seeds which are unprotected by a seed-vessel (*unbedeckte Fruchtstände*).*

123. It has been my object in what I have here brought forward, to state, as clearly and fully as possible, a view, which I think carries much conviction with it. But should the evidence appear to be insufficient, or should my theory meet with much opposition, and appear incapable of universal application, it will become so much the more incumbent on me to note all suggestions, and at some future time to discuss these subjects more minutely and circumstantially, that by giving greater perspicacity to my view, I may earn for it a more universal approbation than I can expect from this first essay.†

Explanation of Plate XI.

Fig. 1. Passage of leaves to bracts in *Anthyllis vulneraria*. 2. Passage of sepals (*a*) to petals (*b*), stamens (*c c*), and stigma (*d*), in *Nymphæa blanda*. 3. Transition from sepal to tubular petal or nectary in *Eranthis hyemalis*. 4. Anther of *Pterandra*. 5. *a*, Stamen, and *b*, style of *Canna Indica*. 6. *a*, Stamen, and *b*, pistil, of *Thalictrum*. 7. Stigmas of *Brachypteris*. 8. Exceptional flower of *Epilobium hirsutum*, in which all the floral whorls are replaced by leaves; *a*, foliaceous petal from the same. 9. Exceptional flower of *Dianthus*, sp. The sepals and some of the petals are removed, to show stalked flower-buds occupying the position of the stamens. 9*a*. Stalked flower-bud from the same; the stalk has a petaloid strap-like scale projecting from it; the sepals and petals are increased in number, the stamens abortive, and the carpels open and disjoined, and in this case destitute of ovules.

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* See note, §§ 83, 101.

† For a brief sketch of the origin and progress of the theory of vegetable morphology, prior to the publications of Wolff, Linné, and Goethe, as well as for an attempt to show what share each author had in the establishment of the doctrine, the reader is referred to an article in the Brit. and For. Medico-Chirurgical Review, January, 1862, entitled "Vegetable Morphology," its history and present condition, by Maxwell T. Masters.

ON THE NARDOO PLANT OF AUSTRALIA.

At the meetings of the Society of German Naturalists and Physicians held at Stettin, Professor Alexander Braun exhibited living specimens of four species of *Marsilea*, two of which (*M. hirsuta*, R. Brown, and *M. salvatrix*, Hanstn.) had been raised from seed received from New Holland, and are called "Nardoo" by the natives. Professor Braun does not agree with Mr. Currey (*supra*, p. 161) in regarding *M. salvatrix* and *M. macropus*, Hook., identical. He thinks *M. salvatrix* undoubtedly distinct from *M. macropus*, but most probably identical with *M. Muelleri*, A. Braun,—a species of which only sterile specimens had been described. Moreover, the name *M. macropus*, given by Hooker in 1854, cannot stand, as the species to which it applies had been named, two years previously (in 1852), *M. Drummondii* by A. Braun. Professor A. Braun added that thirty-eight species of *Marsilea* were at present known, all of which had a very limited geographical distribution.

CHROOLEPUS LAGENIFERUM, *Hildebrand.*

This Alga is of a yellow colour, and was probably introduced from the tropics. It was noticed a few years ago by Dr. Hildebrand in the hothouses of the Bonn Gardens, but lately also in those of Dresden and Berlin, where Palms and Orchids are cultivated.

RARE AND EXOTIC PLANTS AT KEW BRIDGE, SURREY.

The following plants I have met with, from June to September last, on a piece of waste ground at the top of a meadow, at the left-hand of the Surrey side of Kew Bridge, on which for years the rubbish of Kew parish has been shot. The plants to which a * is affixed, are such as are known to be exotic,—some of these, however, seem perfectly naturalized. *Melilotus parviflora* abounds about London, and is frequent about Manchester. *Galinsoga parviflora* is general about Kew, and was seen last year at Parson's Green, Middlesex. *Nicandra physaloides*, which abounds at Kew, is frequent in cornfields near Guild-

ford, and in other parts of Surrey; it has also been found at Parson's Green, with *Potentilla recta* and other exotics. *Mimulus luteus*, *Dipsacus Fullonum*, and one or two others, were not found on the waste ground, but in the wet meadow; the first of these was abundant, and well naturalized. *Xanthium Strumarium* covered large spaces of ground, as did also *Carduus Marianus*.

Papaver somniferum.
Coronopus didyma.
C. Ruellii.
Thlaspi arvense.
Iberis amara.
Lepidium ruderale.
L. sativum.*
Koniga maritima.
Alyssum calycinum.
Arabis albida.*
Nasturtium sylvestre.
Sisymbrium Austriacum.*
Erysimum cheiranthoides.
Diplotaxis muralis.
Medicago orbicularis.*
Melilotus officinalis.
M. arvensis.
M. vulgaris.
M. parviflora.*
Vicia lutea.
Potentilla Taurica.*
P. recta.*
Epilobium roseum.
Eryngium montanum.*
Apium graveolens.
Dipsacus Fullonum.
Carduus tenuiflorus.
C. Marianus.
Centaurea nigrescens.
C. Jacea.
C. Calcitrapa.
Tanacetum vulgare.
Artemisia Absinthium.
Erigeron Canadensis.
Aster Tradescantia.*
A. alpinus.*
Galinsoga parviflora.*
Pinardia coronaria.*
Calendula officinalis.*
C. arvensis.*
Cenia turbinata.*
C. microglossa.*
Anthemis arvensis.
A. tinctoria.
Achillea alpina.*
A. tanacetifolia.*
Xanthium Strumarium.
Datura Stramonium.
Nicandra physaloides.*
Mimulus luteus.
Lycopus exaltatus.*
Mentha rotundifolia.
M. viridis.
Chenopodium urbicum.
Urtica pilulifera.
Phalaris Canariensis.

Exotic examples of the following genera also occurred:—*Brassica*, *Anoda*,* *Onopordum*, *Eupatorium*, *Erigeron*, *Aster*, *Xeranthemum*,* *Anthemis*, *Collomia*,* *Aloysia*.*

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STATIONS OF SOME UNCOMMON PLANTS IN DEVON AND CORNWALL.

Ranunculus trichophyllus, Chaix.—In both a pond and stream, at Crabtree, near Plymouth; new, we believe, to the flora of Devon.

Fumaria pallidiflora, Jord.; *a*, *Jordani*, Bab. Man. 5th ed.—Lee, near Ilfracombe, August, 1863.

Reseda suffruticulosa, L.—On a bank by the South Devon Railway,

at Plymouth. An alien; probably derived from some garden in the neighbourhood. July, 1863.

Cerastium tetrandrum, Curt.—Abundant on a wall at Sutton Road, Plymouth; March, 1863. Braunton Burrows; August, 1863.

Lavatera arborea, L.—Cliffs above Whitsand Bay, between Rame Head and Tregantle, Cornwall. Truly indigenous here. Also in the neighbourhood of Plymouth, where it may have escaped from cultivation.

Lathyrus Aphaca, L.—Near Tamerton Foliott. We first found this rare plant at this station in 1860, and have seen it either on a bank or roadside there every year since that time except 1861.

Rubus saxatilis, L.—On a bank at Common Wood, Egg Buckland. A very satisfactory station, and the only one we know for this plant in Devon.

Epilobium lanceolatum, Bab. Man.—Locally abundant on walls and in dry or slaty soil; and on limestone-rubble heaps at several places in the neighbourhood of Plymouth, as at Crab-tree, by the Plym, near Cann slate quarry, and at Tamerton Foliott. It also occurs near Compton Gifford, at Lipson, Stoke Damarell, Cattedown (on limestone), Pomphleet, Brixton, etc., and moreover claims admittance into the flora of Cornwall, as it grows in an old quarry near St. John's, a village a few miles from Torpoint, Cornwall. We have searched for it in vain in the neighbourhood of Ilfracombe, North Devon.

Tillæa muscosa, L.—A notice of our discovery of this plant at Colwell, near Rumple Quarry, has been already recorded in the Report of the Plymouth Institution for 1861–2, and also in the 'Phytologist;' but as its occurrence in Devon may not be generally known to botanists we give it a place in this list, especially as it abounds some seasons at this, we believe, its only known station in the county.

Orobanche Hederæ, Duby.—Combemartin, North Devon. August, 1863. On Ivy that had rooted in earth on the top of a wall near the sea.

Plantago media, L.—Very rare about Plymouth; the only station we know for it in that neighbourhood being Cattedown, where we found it tolerably abundant in a pasture, on limestone, in May, 1863.

Mercurialis annua, var. *ambigua*, L.—We found this curious monœ-

cious variety of *M. annua* growing as a weed in a vegetable garden at Stoke Damarell, on July 11th, 1863.

Malaxis paludosa, Sw.—A single plant, in a bog on a common between Combemartin and Trentishoe, North Devon. August 10th, 1863.

The places mentioned above are all in Devon when the county is not named.

T. R. Archer Briggs.

NEW PUBLICATIONS.

On the Popular Names of British Plants, being an Explanation of the Origin and Meaning of the Names of our indigenous and most commonly cultivated Species. By R. C. A. Prior, M.D., Fellow of the Royal College of Physicians of London, and of the Linnean and other Societies; translator of 'Ancient Danish Ballads.' Williams and Norgate. 1863.

A work on the origin and meaning of the popular names of English plants, by one who is at once a botanist and a philologist, is both a desirable and a welcome addition to the literature of our science. It is singular, that while so much attention has been paid to the derivation of the so-called classical (but which are, for the most part, semi-barbarous) names by which plants are known to the scientific student, so little has been done for the elucidation of those popular appellations which may more justly be considered as their own. In the work before us this great deficiency is well supplied by one whose acquaintance with Teutonic and Scandinavian literature, as well as with the Greek and Latin and their derivative tongues, peculiarly qualifies him for what must be acknowledged to be a very difficult task. That he has executed it with a conscientious determination to spare no labour of investigation, and to give a fair and candid consideration to every suggestion, whether originating in his own mind or proposed by others, will be evident to all who consult his work, even in a cursory manner. With this view, he has not only carefully studied the older English writers, especially the simplers and herbalists, but has compared them with glossaries both published and manuscript, and with writers of the

same class in other European nations. And he has not even limited himself to this wide field of inquiry, but (following in the footsteps of Bopp and Jacob Grimm) he has extended his researches as far as the Sanskrit, which, in common with those great philologists, he regards as the oldest known, and consequently the earliest accessible source of all linguistic inquiries into the immense family of Indo-European tongues.

Of the many difficulties which beset the etymologist, that which probably first occurs to check his self-satisfaction in the pursuit is to find that the most obvious derivation is not always the true one. Take the following as an example :—

"PRIMROSE, from *Pryme rolles*, the name it bears in old books and MSS. The 'Grete Herball,' ch. cccl., says, 'It is called *Pryme Rolles* of *pryme tyme* because it beareth the first floure in *pryme tyme*.' It is also called so in Frere Randolph's catalogue. Chaucer writes it in one word, *primerole*. This little common plant affords a most extraordinary example of blundering. *Primerole* is an abbreviation of Fr. *primeverole*, It. *primaverola*, dim. of *prima vera*, from *fior di prima vera*, the first spring flower. *Primerole*, as an outlandish unintelligible word, was soon familiarized into *prime rolles*, and this into *primrose*. This is explained in popular works as meaning the first rose of the spring, a name that never would have been given to a plant that in form and colour is so unlike a rose. But the rightful claimant of it, strange to say, is the daisy, which, in the south of Europe is a common and conspicuous flower in early spring, while the primrose is an extremely rare one, and it is the daisy that bears the name in all the old books. See Fuchs, p. 145, where there is an excellent figure of it, titled *primula veris*; and the 'Ortus Sanitatis,' Ed. Augsb. 1486, ch. cccxxxiii., where we have a very good woodcut of a daisy titled 'masslieben, Premula veris, Latine.' Brunfelsius, ed. 1531, speaking of the Herba paralysis, the cowslip, says, p. 190, expressly, 'Sye würt von etlichen Doctores *Primula veris* genannt, das doch falsch ist, wann *Primula veris* ist matsomen oder zeitlosen.' Brunschwygk, b. ii. c. viii., uses the same words. The Zeitlose is the daisy. Parkinson, Th. Bot. p. 531, assigns the name to both the daisy and the primrose. Matthioli, Ed. Frankf. 1586, p. 653, calls his Bellis major '*Primo fiore maggiore*, seu *Fiore di prima vera*, nonnullis *Primula veris major*,' and figures a Chrysanthemum. His Bellis minor, which seems to be our daisy, he calls '*Primo fiore minore, Fior di primavera*, Gallis *Marguerites*, Germanis *masslieben*.' At p. 833, he figures the cowslip, and calls that also '*Primula veris*, Italis *Fiore di primavera*, Gallis *primevere*.' But all the older writers, as the author of the 'Ortus Sanitatis,' Brunschwygk, Brunsfels, Fuchs, Lonicerus, and their contemporaries, with the single exception of Ruellius, assign the name to the daisy only.

Primula veris, L. acaulis."

In this, it will be seen, we have also an instance of another great and startling difficulty in the way of botanical etymology, viz. the

transfer of names between two very different plants, and those even so universally known and diffused as the Daisy and the Primrose; a transfer, perhaps, still more strikingly exemplified in the case of the Forget-me-not.

"FORGET ME NOT, a name that for about forty years has been assigned to a well-known blue flower, a Myosotis, but which for more than 200 years had in this country, France, and the Netherlands, been given to a very different plant, the ground-pine, Ajuga Chamæpitys, on account, as was said, of the nauseous taste that it leaves in the mouth. It is to this plant exclusively that we find it assigned by Lyte, Lobel, Gerarde, Parkinson, and all our herbalists from the middle of the fifteenth century, and by all other botanical authors who mention the plant, inclusive of Gray in his 'Natural Arrangement' published in 1821, until it was transferred with the pretty story of a drowning lover, to that which now bears it. This had always been called in England Mouse-ear Scorpion-grass. In Germany Fuchs, in his Hist. Plant., Basil, 1542, gives the name *Vergiss nit mein* to the Teucrium Botrys, L., under the Lat. synonym of Chamædrys vera fæmina. His excellent plate at p. 870 leaves no doubt as to the species he meant. In Denmark a corresponding name, *Forglemn mig icke*, was given to the Veronica Chamædrys. At the same time it would seem that in some parts of Germany the Myosotis palustris was known as the Echium amoris, and *Vergiss mein nicht*, as at the present day. Some idea of the confusion will be seen in Mentzel's 'Index Nominum Plantarum,' Berlin, 1682. Cordus on Dioscorides, in 1549, and Lonicerus assign it to Gnaphalium leontopodium, L.; while the 'Ortus Sanitatis,' Ed. 1536, ch. 199 and Macer 'de virtutibus herbarum,' Ed. 1559, like the Danish herbalists, give it to the Veronica Chamædrys, L. This latter seems to be the plant to which the name rightfully belongs, and to which it was given in reference to the blossoms falling off and flying away. See SPEEDWELL. From this plant it will have been transferred to the ground-pine through a confusion in respect to which species should properly be called *Chamædrys;* and as both these very different plants were taken for the Chamædrys of Pliny, the popular name of the one passed to the other. Two circumstances about it are curious; first, how the name could be transferred from the ground-pine to the scorpion-grass without the change being noticed by a single author of all our floras, general and local; and secondly, how easily a good story is got up, and widely spread about the world, to match a name. The blossoms fall from a Veronica, and it is called 'Speedwell!' and 'Forget me not.' The name passes to a plant of nauseous taste, the ground-pine, and Dalechamp explains it as expressive of this disagreeable quality. It attaches itself to a river-side plant, and the story books are ready with a legend. We learn from Mills's 'History of Chivalry' that a flower that bore the name of 'Soveigne vous de moy,' was in the fourteenth century woven into collars, and worn by knights, and that one of these was the subject of a famous joust fought in 1465 between the two most accomplished knights of England and France. What the flower was that was so called, it would be only possible to discover by inspection of one of these collars; but there is

certainly no ground for assuming that it was the same as our present 'Forget me not.' The story of this latter, in connection with the two lovers, will be found in Mills's work, vol. i. p. 314. Myosotis palustris, L."

The Primrose afforded us an example of the corruption of a name clearly proved by historical evidence; in the word Cowslip the corruption is more of an inferential character, but there is here also strong presumption that the literal etymology could not be the correct one. To solve the difficulty, our author proposes first an etymological correction, and then a bold metonymical change, in neither of which are we disposed to concur, although we cannot but admire both the plausibility of the conjecture and the ingenuity with which it is supported :—

"COWSLIP, -LAP, or -LOP, of different dialects, Anglo-Saxon *cuslippe*, and in Ælfric's Glossary *cusloppe*, a name of very uncertain derivation, possibly a corruption of Anglo-Saxon *cyslib*, the Scotch *keeslip* or *kislop*, the Old High German *chesiluppa*, or *chesluppe*, rennet. It admits, however, another and very different explanation, which is probably the right one. The plants of the cowslip and primrose kind were once comprehended with the Mulleins under *Verbascum*, and one species of this, the V. Thapsus, is called Bullock's Lungwort from having been used in the pneumonia of cattle, an application of it suggested by the resemblance of its thick woolly leaves to the dewlap of a bullock. The last syllable of *Cowslip*, *-lap*, or *-lop* will, in this view of it, be the Anglo-Saxon *læppa*, or *lappa*, a lap or border, and the name, meaning Cow's dewlap, have originally belonged to the Mullein, but by some blunder have been transferred to a different Verbascum, our present Cowslip. Primula veris, L."

The two following extracts will serve to illustrate the wider range taken by the author, in illustration of names of a simpler and more elementary character, and therefore admitting of being traced through various kindred languages and up to their original root :—

"OAK, Anglo-Saxon *ac*, *æc*, Scot. *aik*, Old Norse *eik*, Sw. *ek*, Da. *eg*, Icel. *eyk*, Low Germ. *eek* and *eik*, Germ. *eiche*, Old High Germ. *eih*, the *h* having a guttural sound. All these words refer to the fruit of the tree, the acorn, from which the oak took its name, and etymologically are identical with *egg*, so that these two objects, the *oak* and the *egg*, will be found to have either the same name in their respective languages, or, interchanging the signification, to have a name for *egg* in one, that means *oak* in another. The obvious similarity of shape sufficiently explains it. See EYE. The oak, like other trees, takes its name from its most useful product. 'During the Anglo-Saxon rule,' says Selby, p. 227, 'and even for some time after the Conquest, oak forests were chiefly valued for the fattening of swine. Laws relating to pannage, or the fattening of hogs in the forest, were enacted during the heptarchy; and by Ina's

statutes, any person wantonly injuring or destroying an oak tree was mulcted in a fine varying according to its size, or the quantity of mast it produced.' Ακυλος, which occurs in Homer, Odyss. x. 242, as the name of the *acorn*, is said by Plato to have been adopted from northern nations, and Grimm and Adelung consider it to be identical with the G. *eichel;* but as the initial ἀ is short, it would seem rather to be the L. *oculus*, an eye, although certainly *oculus* is not found used in a metaphorical sense for an acorn.

Quercus, L."

"Eye, the pink, Fr. *œillet*, in Tusser called 'Indian eye,' from the eye-shaped marking of the corolla. Dianthus, L.

"*Eye*, a word that, with allowance for dialect, is widely spread through the whole group of Ind-European languages, Anglo-Sax. *eage* and *æg*, Fries. *âge*, Germ. *auge*, Low Germ. *oog*, Da. *öje*, Sw. *öga*, Old Norse *auga*, Goth. *augô*, and very similar words in the Slavonian dialects, the Lett, and the Old Prussian, Lith. *ahi*, Zend. *ashi*, Skr. *akshi*, Gr. ὀκος and ὀκκος, and L. *oculus*. It is also the same word as *egg*, Anglo-Sax. *æg*, and Gr. ὠον, L. *ovum*, where the *v* replaces the *g* of the northern *oog;* as the first syllable in our misspelt island, Anglo-Sax. *eg-* or *ig-land*, Germ. *eiland;* and as the first syllable of *acorn*, Germ. *eichel*, Du. *eekel*, Da. *aggern*. The similarity of the oval form in these objects has led to the use of the same name for them all. But, further, the egg, having no beginning or end, has come to be used as a symbol of eternity, and thence the Gr. ἀει, ever, Anglo-Sax. *æg-*, Goth. *aiw*, and L. *æv* in *ævum;* and possibly, from its even boundless surface, the *æq* in L. *æquor* and *æquus*. A bird's egg was the first meaning of the word, and this, by a metaphor was applied to the eye, and from the eye extended to an eye-land, from the latter standing in the sea, like the eye in the face, as remarked by Spelman, p. 194: 'Est autem *Eage* proprie oculus et ovum, nomenque hinc contraxit insula, quod instar oculi vel ovi se in mari exhibet.' See Oak."

From these extracts, a fair idea may be formed of our author's mode of treating his subject, and they will suffice to show how thoroughly he has investigated it. We could have wished, indeed, that he had sometimes devoted a little more space to the examination of conflicting opinions on controverted points, and that he had noted, under each of the older names, the earliest work, printed or manuscript, in which its use could be traced. This would probably have involved little additional labour on his part, and would have supplied a chronological want which those who take an interest in the names of our native plants must have often felt. In discharge of our critical duty, we must also not omit to notice a slip of the pen, under "Timothy-grass," which is stated to have been so named "from having been brought from New York by Mr. Timothy Hanson, and introduced by him into Carolina, and thence into England." We presume that this statement was in-

tended to apply only to the name, and not to the Grass itself (*Phleum pratense*), which has always been one of the most widely-diffused of European Grasses, and is believed to have been introduced into North America by cultivation alone.

With one other extract we will close our notice of a work which, for the fulness of its nomenclature, the large amount of information brought to bear upon individual names, and the thoroughly conscientious character of its investigations, must necessarily become the standard book of reference in the interesting branch of study on which it treats.

"BEECH, Anglo-Sax. *boc*, *bece*, *beoce*, Old High Germ. *puocha*, Middle High Germ. *buoche*, Germ. *buch*, Du. *beuk*, Old Norse *beyki*, Da. *bög*, Sw. *bok*, words which, in their several dialects, mean, with difference of gender only, a book and a beech-tree, from Runic tablets, the books of our ancestors, having been made of this wood. The origin of the word is identical with that of the Skr. *bôkô*, letter, *bôkôs*, writings; and this correspondence of the Indian with our own is interesting as evidence of two things, viz. that the Brahmins had the art of writing before they detached themselves from the common stock of the Indo-European race in Upper Asia, and that we and other Germans have received alphabetic signs from the East by a northern route, and not from the Mediterranean. For if we had learnt the signs from Greeks or Romans, we should have adopted their names for a book, and for writing materials, as the Celtic nations have done. On the other hand, in the Greek word βιβλος, the name of an Egyptian plant, we see, independently of history, that book-writing was introduced among the Greeks as a foreign art, and that they had left the parent stock before its invention. The German term *buch-stab*, a beech-stave, is still retained in the sense of a letter, the tree and its wood having in the northern nations taken their name from their use in writing. Tacitus certainly says, 'Literarum secreta viri pariter ac feminæ ignorant.' De Mor. Germ. c. 19. The eastern origin of this word is, however, an unquestionable evidence that they not only did know letters then, but must have known them from the time that they separated from the Indian branch of our common family. It is to be remarked that the Greek word βιβλος and Latin *liber*, meant primarily the material, and only in a secondary sense a book; while our *beech* means primarily the book, and only in a secondary sense a tree. The word *write*, Anglo-Sax. *writan*, like the Greek γραφειν, and the Latin *scribere*, dates from a time when letters were scratched, and not painted or penned, and is an additional evidence that the art was not of Roman introduction, or we should have had some derivative of *scribere* to denote it. Beech was the wood of which Runic almanacs were made, several of which are still preserved.

Fagus sylvatica, L."

In confirmation of the hypothesis "that we and other Germans have received alphabetic signs from the East by a northern route, and not by the Mediterranean," it may not be irrelevant to quote a couple of

lines from Ovid's Thirteenth Epistle of the Fourth Book, "Ex Ponto," which, as far as we are aware, have not been previously cited with this view:—

> "Ah pudet! et Getico scripsi sermone libellum;"

and—

> "Hæc ubi non patria perlegi scripta Camena."

Now, although the belief is general that Ulphilas constructed the Gothic alphabet on the basis of the Greek in the fourth century, we have here more than presumptive proof of the existence of Gothic writing at a much earlier period; for it is not at all probable that Ovid undertook the difficult task of adapting the Roman characters, simply for his own use, to the Gothic language in which he wrote. What a treasure his panegyric on Augustus, "sermone Getico," would have been to the antiquarian philologist, had it been preserved along with his other writings to the present day!

BOTANICAL NEWS.

Mr. Black, the Curator of the Kew Herbaria, whose courtesy and ready assistance to those who consulted these collections are beyond praise, has been appointed Superintendent of the Botanic Garden at Bangalore.

A number of scientific men,—among them Messrs. Bentham, Currey, and J. Hooker,—deeming the manner in which the progress of science and the labours and opinions of our *savants* are recorded in the weekly press inadequate, have held several consultations with the view of establishing a weekly paper which would afford scientific men the means of communication between themselves and the public; but, on mature consideration, they have resolved to abandon the project, and join the scientific staff of the 'Reader.'

The total number of Chinchona plants on the Neilgherry hills on October 1st, was 233,476; the propagation during the previous month having been 15,874. The height of the largest plant was 9 ft. 6 in., the circumference of its stem, 6 in. above the ground, and the green bark on this stem is nearly half an inch thick.

Dr. Lankester has resigned the post of Examiner in Botany to the Science and Art Department at the South Kensington Museum.

Mr. Gustav Mann has been appointed Superintendent of the Chinchona plantations in Darjeeling, under Dr. Anderson.

Dr. Welwitsch, the African explorer, has arrived in London with a view of arranging and describing his large collection of dried plants from the parts he has visited.

Professor Schleiden has been elected to the chair of Botany and Anthropology at Dorpat University.

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